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# **Planning and Managing Intermodal Transportation Systems: A Guide to ISTEA Requirements**

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**Intermodal Division  
Office of Environment and Planning  
Federal Highway Administration  
400 Seventh Street SW  
Washington, DC 20590**

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**Final Report  
November 1994**

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## EXECUTIVE SUMMARY

This guidebook is designed to be a hands-on, planner-friendly document that answers hard questions about intermodal management system planning *in practice*.

The guidebook is written from the perspective of the Commonwealth of Massachusetts' development of its *statewide* intermodal management system work plan, which includes coordination with all the state's MPOs. The guidebook has been written in the spring and summer of 1994, before the actual submission of the Massachusetts IMS work plan.

Intermodalism, like beauty, is in the eye of the beholder. The word *intermodal* means very different things to different people. *Intermodal* like a point in mathematics, may best remain undefined so other things can be defined using it as a basis. Some definitions are offered for discussion in this guidebook (Section 1.2), but Massachusetts has not etched definitions in stone; rather it has kept the IMS process definitionally flexible, because intermodalism itself is a moving target on our scope of the future.

The following subjects of interest to IMS planners are discussed in this guidebook:

- ISTEA in perspective and important points in the December 1, 1993, Interim Final Rule (Section 1.3)
- Work plan structure and content (Sections 2.2)
- IMS technical team and coordinating committee organization and composition (Sections 2.3-2.4)
- Explanatory materials to provide the IMS technical team and coordinating committee (Table 2.5)
- Organization and implementation of a Freight Advisory Council to foster involvement of the private sector companies and organizations (Section 2.7)
- Emphasis on "issue-based data" to structure IMS data needs and narrow the data search (Section 3.1)

One of the key elements of this guidebook is an emphasis on data sources and databases--**particularly freight intermodal** ones--that are useful for "calibrating" the performance measures which an IMS team establishes. Data for intermodal purposes are basically of three types:

### **You have it:**

Available freight traffic, flow and facility data online or in hard copy within agencies

Recyclable data--data collected for other purposes which can be used for the IMS

### **You don't have it, but you can get it:**

Available data acquired from outside (consultants, suppliers, etc.)

**You don't have it yet--and may never:**

- Newly collected data--trucking company surveys, automatic traffic recorder (ATR) placement plans, consultants brought in to develop new flow or facility characteristics data
- "Druthers data"--data that you'd like to have if you had your "druthers," but that might realistically be unavailable (too much money, personpower, time, and so on)

An "Intermodal Database Description Form" is provided (Table 3.1) to indicate the types of information to be collected on each database that is available or becomes available.

Where do I get data? That is a common question among statewide and MPO planners who are used to passenger-oriented planning and to whom "intermodal management system" is a new phrase. The arena of freight transportation databases is unknown territory to many. This guidebook gives the details--the organizations, groups, directory publishers, and other sources planners can use (Section 3.3).

What models and procedures are available for analyses based upon intermodal data? This guidebook highlights freight forecasting and urban goods movement methods and models in the literature (Section 3.9). The annotated bibliography cites sources for classic freight forecasting models as well as for less sophisticated back-of-the-envelope techniques.

A list of intermodal facilities in Massachusetts is included to show other states using this guidebook the types of facilities which can be considered a part of the statewide intermodal transportation system. Maps of the Massachusetts intermodal freight corridors and interregional intermodal passenger corridors are included (Section 4.1). Information on the trucking industry and trucking activity nodes is covered in great detail, since drayage carriers as well as long-haul carriers often represent a vital connection among the modes (Section 3.5 and Table 4.5).

We are now in the beginning stages of an increasingly intermodal, some say multimodal, era. Intermodal management systems were meant by the ISTEA legislation which established them in 1991 to be long-term helpmates in the statewide planning and metropolitan planning processes. An IMS is a vital *decision support system* for policy makers and senior management. Based upon the evaluations and analyses developed from a strong yet flexible intermodal management system, those policy- and decisionmakers have the input for prioritizing projects in Transportation Improvement Programs (TIP) and Transportation Plans, evaluating strategic alternatives, and planning systematically yet flexibly for the twenty-first century's many intermodal challenges.

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# 1. INTRODUCTION: STATES AND MPOs ARE ASKING QUESTIONS THAT NEED ANSWERS

This guidebook is designed to be a hands-on, planner-friendly document that answers the hard nonconceptual questions that other planning descriptions don't answer. This is meant to be a guidebook with a local, regional, and small-state perspective on issues and challenges, with a strong focus on access to issue-based freight intermodal data.

Some of the questions answered in this guidebook:

- What is intermodal freight planning and why do I need to include it in my primarily passenger-oriented metropolitan and statewide planning processes?
- What is an intermodal management system *in practice* at the state and MPO levels?
- Yes, I've read the Federal Register notices and the FHWA and FTA general guidelines, but what do *I* do here in [reader, insert your state or MPO--e.g., *Mississippi*]?
- How do I *use* the intermodal management system? How does it interrelate with my statewide and MPO transportation plans and transportation improvement programs (TIPs)? How do I prioritize TIP projects with the IMS?
- How do I develop the work plan I'm required to submit by October 1, 1994? (Once developed, the work plan will show tasks to be done after 10/1/94.)
- How do I organize my IMS Technical Team?
- What state agencies and MPOs do I include on the team?
- How do I coordinate with the other five management system teams and the traffic monitoring system for highways team?
- What are the challenges at the *interfaces* between and among management systems and teams--what is the potential overlap and how do I resolve that? For example, do I include passenger intermodal in the CMS rather than the IMS, and what happens if I do?
- How do I organize and implement private sector involvement (Freight Advisory Council)?
- Where do I get data for my regional and statewide models--freight intermodal flow data, facility characteristics data, and performance measures data?
- What state and MPO agencies have or may have data and what kinds of data are we talking about? What is intermodal data, anyway?

- What is issue-based data and how do I use that concept to direct my data search and prioritize my data options?
- What organizations, groups, directory publishers, and other sources can I use?
- We don't want to reinvent the wheel. Who has done this before and what have they done--what are other states and MPOs doing in the intermodal management system arena?
- What quantitative models do I use to analyze these data? What is there in the transportation literature available to help me home in on the models that might be appropriate for my purposes in the four-step modeling process and/or for statewide planning?
- What nonquantitative modeling structures and procedures are there--simple, back-of-the-envelope techniques to analyze intermodal data for urban and regional planning purposes?

## 1.1 Defining Intermodalism

The word "intermodal" means very different things to different people. To propose a universal definition may not be useful.

Like a point in mathematics, some things need to remain undefined so other things can be defined. Although the Intermodal Surface Transportation Efficiency Act (ISTEA) was passed in 1991, the National Commission on Intermodal Transportation (NCIT) is only now in May and June of 1994 holding hearings to "gather the public's views of what intermodalism should be" (Journal of Commerce, April 6, 1994).

Since ISTEA was passed, intermodalism has been in the forefront of transportation issues. When Secretary of Transportation Federico Pena dedicated the National Highway System (NHS), a component part of the proposed new National Transportation System (NTS), he did it not at a major highway interchange but at Union Station in Washington, D.C., a major intermodal hub on the rail network. The Alameda Corridor project in southern California has been continuously in the news. And the increase in rail/truck intermodal partnerships dominated the transportation news in 1993.

Strictly defined using the Latin roots of the word (*inter* = between; *modus* = way), intermodal suggests transportation between different ways of transporting a good or a person. If a person or commodity moves by more than one mode, it has moved intermodally.

Table 1.1 contains possible definitions related to the concept of intermodal transportation that the reader might like to discuss with his/her own colleagues.

## Table 1.1

### Basic Definitions for Use in Planning

#### an Intermodal Management System

(Discussed with members of, but never approved by the full Massachusetts IMS team)

**MODE:** A way of transporting freight and/or passengers. Commonly accepted identifiers for the **freight** modes include: Highway-Truck, Rail, Pipeline, Air, and Water (Inland or Oceanborne). For IMS purposes, the **interregional passenger** modes include: Highway-Bus, Rail, Air, and Water (e.g., Ferry or Cruise Ship).

**INTERMODAL:** Pertaining to the transfer and flow of people and/or goods from one mode to another or among several modes.

**MAJOR LINEAR TRANSPORTATION FACILITY (MLTF):** Linear fixed surface transportation facility or air/water travel lane on or in which transportation operating equipment moves from place to place; categorization as "major" is based upon access control, revenue threshold of operating companies, magnitude of traffic, or other such attributes. Massachusetts examples: NETI\*-defined freight railroad "regional main line" (Conrail, Boston & Maine), Amtrak line, limited-access highway (NHS and other Principal Arterials), oceangoing vessel or cruise ship trade lane used by more than [insert regionally appropriate number] ships per year, navigable river (Connecticut, Merrimac), air passenger corridor used by more than [appropriate number] scheduled flights per year. (\*New England Transportation Initiative)

**MAJOR INTERMODAL CORRIDOR (MIC):** An elongated area [in Massachusetts] within which there are two or more different, usually parallel, major linear transportation facilities representing two or more modes; major linear transportation facilities within the same corridor should be within [e.g., 10] miles of each other for the majority of the length of the corridor. Massachusetts MICs connect to major intermodal corridors in New York and the other New England states.

**FEEDER OR DISTRIBUTIVE CORRIDORS (FC, DC or FC/DC):** An elongated area [in Massachusetts], connected to and often nearly perpendicular to a major intermodal corridor but extending beyond its borders, within which there are one or more linear transportation facilities serving the functions of feeding goods and/or passengers from their origins to a major intermodal corridor or corridors and/or distributing them from a major intermodal corridor or corridors to final destinations. A *major* feeder corridor or distributive corridor would have one or more *major* linear transportation facilities as defined above. Major or minor feeder/distributive corridors are **not necessarily intermodal**; even a major feeder/distributive corridor such as I-495 may not have other modal alternatives closely paralleling it, partly because it is circumferential. Thus an FC/DC can be the same as its defining MLTF.

**MAJOR INTERMODAL FACILITY (MIF):** "Polygonal" facility, usually but not necessarily within a major intermodal corridor, at which more than [appropriate number] transfers from one mode to another occur per year. Examples: large rail/truck facilities (Conrail's Beacon Park facility), Port of Boston's Conley and Moran Terminals, intercity bus company stations, fuel tank farms at pipeline termini, and trucking company headquarters or terminals for ICC Class I or II for-hire motor carriers of property (above \$3 million in revenue).

## 1.2 ISTEA Recognizes the Importance of Intermodalism and Mandates Intermodal Management Systems

To better plan for an intermodal world, ISTEA mandated the development of six management systems and one monitoring system. One of the six management systems is the intermodal management system. IMS compliance schedule dates are in Table 1.2.

### 1.2.1 December 1, 1993, Interim Final Rule

The most recent official instructions relating to management systems were published in "Management and Monitoring Systems: Interim Final Rule" (IFR) (Federal Register, December 1, 1993, pp. 63442-63485). In that IFR, one of the primary reasons for setting up an IMS is highlighted (p. 63449): "Section 500.105(g) (500.105(c) in the NPRM) requires that the **results of the management systems be considered** in developing metropolitan and statewide transportation plans and improvement programs and in making project selection decisions." Indeed one of the outputs of an IMS would be quantitative results of analyses that could be used to prioritize projects and programs.

The IFR highlights another objective of the IMS: "Section 500.105(j) (500.107(e) in the NPRM) requires that each management system include appropriate means to evaluate the effectiveness of implemented actions and that the effectiveness of all of the systems combined be periodically evaluated, preferably as part of the planning processes."

The IFR summarized what had to be done by those planning a state IMS: "[The] processes and procedures that must be included in a State IMS...consist of [1] identification of intermodal facilities and performance measures, [2] data collection and system monitoring, [3] performance evaluation, and [4] identification of strategies and actions. Also the expected results of an IMS are described" (p. 63469).

The IFR found "advanced technologies" and "innovative marketing techniques" worthy of special mention and inclusion in IMS planning: "[It is required that] the intermodal management system...include **methods for increasing the use of advanced technologies, and methods to encourage the use of innovative marketing techniques, such as just-in-time deliveries**" (p. 63469).

The IFR identified four "C" words that are at the core of IMS planning: "500.705...(b) The IMS shall address intermodal transportation needs by a process that considers the following issues: (1) *Connections*. The convenient, rapid, efficient, and safe transfers of people and goods among modes that characterize comprehensive and economic transportation service; (2) *Choices*. Opportunities afforded by modal systems that allow transportation users to select their preferred means of conveyance; (3) *Coordination and cooperation*. Collaborative efforts of planners, users, and transportation providers to resolve travel demands by investing in dependable, high-quality transportation service either by a single mode or by two or more modes in combination" (p. 63483).

**Table 1.2**  
**Compliance Schedule Dates**  
**for the**  
**Intermodal Management system**

Due Date	Subpart	Element
9/30/04	500.107 (b)	Governor must notify FHWA Division Administrator of the certifying official(s)
10/1/94	500.709 (a)	IMS work plan with activities, responsibilities, and schedules developed; inventories and data collection initiated
1/1/95	500.107 (c)	Certification statement (work plan must be attached) due to FHWA by January 1 of each year, beginning 1/1/95
1/1/95	500.109 (a)	USDOT may withhold funds for any FY after 9/30/95 from states failing to submit annual certification
10/1/95	500.709 (b)	Performance measures and standards established; system design completed or underway; data collection underway
10/1/96	500.709 (c)	IMS fully operational and in use when developing MPO and state TIPs

## 2. ANSWERS TO STATE AND MPO QUESTIONS ABOUT IMS ORGANIZATIONAL ISSUES

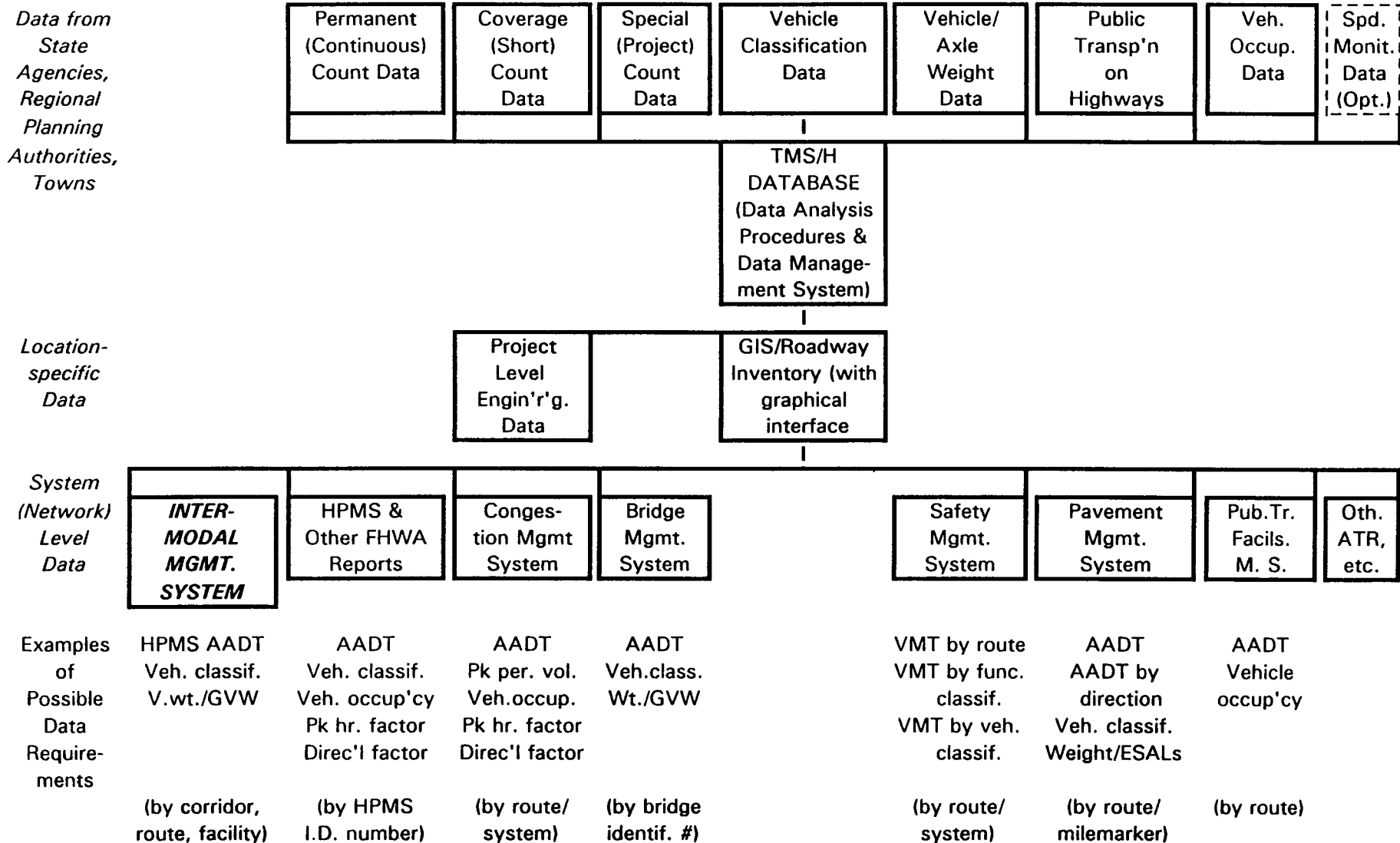
### 2.1. What's an IMS in practice?

"500.705...(b) The IMS shall address intermodal transportation needs by a process that considers the following issues: . . . connections, . . . choices, . . . coordination and cooperation."

An IMS in practice is a *structured process* for information and data collection, analysis and synthesis and evaluation of alternative strategies to provide transportation professionals with the foundation for making strategic and policy decisions. Much of the data is in the private sector. Planners, and transportation companies will have to work together to develop appropriate databases ("cooperation"). Many transportation and other agencies within the states and MPOs must work closely together as a team to develop the IMS process and structure.

The six management systems and the traffic monitoring system for highways must *work together* ("coordination"). (Figure 2.1 shows the relationship between the IMS and the traffic monitoring system.) In the end they should be viewed as one management system with interdependent components. Ultimately the intermodal management system will provide alternatives, "choices," options, flexibility, and increased efficiency/mobility/accessibility within the total transportation system--not just at isolated "connections" or transfer points in the intermodal system today, but throughout the intermodal corridors in our constantly changing transportation environment.

**Figure 5.1**  
**Relationship Between IMS**  
**and Traffic Monitoring System for Highways**



## 2.2 Developing the IMS Work Plan

What is the work plan that the IMS team must complete by October 1, 1994? The Interim Final Rule (p. 63450) notes that "the work plan will be used as the measure of compliance." It is defined (p. 63448) "to mean 'a written description of major activities necessary to develop, establish, and implement a management or monitoring system, including identification of responsibilities and target dates for completion of the major activities.'"

Figure 2.2 shows the work plan development tasks used in Massachusetts. Note that these are tasks to be completed to *develop* the work plan, not tasks to *do* that are spelled out in the work plan. The organization of teams and committees which used the chart to develop the management system work plans is outlined on the following pages. Figure 2.2 includes coordinating committee tasks and technical team tasks. Technical teams for each of the management and monitoring systems used the same outline of tasks to *develop* their work plans, ensuring that there would be greater coordination among the final products--the work plans for each of the systems.

**Figure 2.2**  
**ISTEA Management Systems Work Plan Development Tasks**

<b>Work Plan Development Tasks</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug</b>	<b>Sep</b>
<b>Technical Coordinating Committee Tasks</b>								
1 Project Oversight and Management								
a. Implement the Organizational Approach								
b. Allocate Resources								
c. Monitor and Document Progress								
2 Reconnaissance of Internal and External Elements								
a. Federal requirements								
b. existing internal data systems								
c. other states/MPOs								
3 Develop Overall Work Plan Development Scope and Schedule								
4 Coordinate Public Participation								
5 Coordinate Overall Management Systems Technical Architecture								
a. Develop coordinated reference systems:								
<b>Technical Team Tasks</b>								
1 Technical Team Management and Coordination								
a. Identify and recruit technical team participants								
b. Develop team decision-making process								
c. Develop coordination mechanisms								
d. Identify and commit participant resources								
e. Develop detailed team work scope and schedule								
f. Monitor progress and document								
2 System Coverage Areas/Facilities Identification								
a. Identify geographical coverage area								
b. Identify included facilities								
c. Identify reference system								
3 Performance Evaluation System Design								
a. Identify alternative performance measures								
b. Evaluate data availability								
c. Evaluate alternative performance measures								
d. Select recommended performance measures								
e. Develop performance measure standards								
4 Data Collection and System Monitoring Program Design								
a. Identify data requirements/needs								
b. Evaluate current data collection processes/procedures								
c. Evaluate available/alternative data collection procedures								
d. Develop/revise data collection processes/procedures								
e. Evaluate data collection program resource requirements								
f. Develop implementation plan								
g. Develop operation plan								
5 Data Management and Analysis Systems Design								
a. Identify alternative systems and processes								
b. Develop measures of effectiveness								
c. Evaluate alternative systems and processes								
d. Select recommended systems and processes								
e. Develop implementation plan								
f. Develop operation plan								

## 2.3 How do I organize my IMS team?

As many as possible of the state's transportation and related agencies should be represented on committees, task forces, or teams working toward development of the IMS. In Massachusetts, the six management systems and one traffic monitoring system are overseen by a steering committee composed of senior managers. There is a technical coordinating committee which is composed of the technical team leaders for each of the seven teams, and each management system has a technical team composed of a team leader and representatives from a wide variety of agencies.

## 2.4 What are the typical agencies included in the IMS planning process?

The Interim Final Rule notes (p. 63447) that "the mechanism for carrying out the cooperative process is to be determined jointly by the cooperating agencies."

A valuable resource for those who are organizing committees, task forces and teams including transportation-related agencies is published by the American Association of State and Highway Transportation Officials (AASHTO): Organization Charts of State Highway and Transportation Departments, 1990 (prepared by AASHTO's Administrative Subcommittee on Personnel and Human Resources).

In Massachusetts, the IMS is being designed for statewide use and the state is responsible for IMS development and coordination. MPOs or regional planning agencies (RPAs) are involved in the process on committees and teams described below. In larger states, certain MPOs might plan their own IMS (e.g., Birmingham, AL). This guidebook can be used by states or MPOs. MPO planners in other states can find much to use since Massachusetts is small with a few large MPOs (e.g., Boston, Springfield, and Worcester).

In Massachusetts there is a steering committee of senior management personnel, a technical coordinating committee where management and monitoring system team leaders get together, and the individual technical teams for each MS. The IMS team currently has representatives from the following MPO, state, and federal agencies (listed alphabetically):

Massachusetts Bureau of Transportation Planning and Development  
 Central Transportation Planning Staff/Boston Metropolitan Planning Organization  
 Massachusetts Executive Office of Transportation and Construction  
 Massachusetts Aeronautics Commission  
 Massachusetts Association of Regional Planning Agencies (and individual RPAs)  
 Massachusetts Bay Transportation Authority  
 Massachusetts Highway Department  
 Massachusetts Port Authority (Massport)  
 Metropolitan Area Planning Council  
 New England Transportation Initiative/EOTC  
 U.S. Federal Highway Administration  
 U.S. Federal Transit Administration

Other agencies not now on the team but with which the team coordinates or will coordinate for data and advice include:

Massachusetts Coastal Zone Management Office  
Massachusetts Department of Public Utilities  
Massachusetts Department of Revenue (re: motor carrier fuel tax database)  
Massachusetts Executive Office of Economic Affairs  
Massachusetts Executive Office of Environmental Affairs  
Massachusetts Office of International Trade  
Massachusetts Registry of Motor Vehicles  
Massachusetts Turnpike Authority

## **2.5 What do I provide to my IMS team--what instructional/explanatory materials?**

As an example of some of the things that might be provided to the team, please see below the list of materials used in Massachusetts (Table 2.1) and the List of References which highlights materials used in other states for IMS planning and development.

**Table 2.1**  
**Master List of Materials ("Handouts")**  
 Provided to Massachusetts IMS Technical Team Members  
 January-February 1994

*Bibliography:*

"Intermodal Freight Planning Sources/Data/Contacts." Prepared by the Massachusetts IMS Technical Team leader, this is a bibliography of reports, directories and journal articles and a compilation of notes on contacts internally (Massachusetts agencies) and externally (consultants, other MPOs/states, and other groups), January 1994. The first 6 pages of this 50+-page online document were handed out to IMS team members as an example of what was available upon request.

*Classification of modes:*

"Modes for I.M.S. Purposes," January 1994. A one-page spreadsheet showing a taxonomy of passenger and freight modes for intermodal planning purposes.

*Data description form(s):*

Forms designed to record characteristics, location, and contact information for intermodal-management-system-related databases. 1 page.

*Definitions:*

Definitions were not discussed at the full team level but rather were "floated" among a subgroup of the IMS team. It was decided that too much time would be wasted trying to come to agreement on various definitions. The definitions, which were written by the team leader, are included on an earlier page for potential use by other states and MPOs.

*Federal Register instructions:*

"Management and Monitoring Systems Regulations; Subpart G--Intermodal Transportation Facilities and Systems Management System." A 14-page synthesis (prepared by Roland Hebert) of the intermodal-relevant parts of the December 1, 1993 Federal Register Interim Final Report article (pp. 63442-63485). See also "Tasks . . ." below.

*Freight Advisory Council:*

"Freight Advisory Council" organizing memo (internal to state agencies), a "Freight Advisory Council Sample Letter" (that would be sent to potential members of the Council, inviting them to participate and attend the first meeting), and a listing of "Freight Advisory Council Contacts" (a spreadsheet providing contact names, company affiliations, addresses, and phone numbers for potential members of a Freight Advisory Council). Also, on the general subject of public involvement in the management system planning process, a page from the January 1994 issue of the trade journal, Planning, was provided to the team; it listed an office at FHWA which had a publication available on the subject.

**Table 2.1--Continued**

*Highway traffic count/vehicle classification information*

Several handouts provided information on what was already available through the HPMS data offices of the Massachusetts Highway Department and through "special counts" that had been taken for particular projects within the past three years. It is imperative that the IMS team *recycle* past data and think creatively about what has already been done. Hiding in the file drawers of many agencies are intermodal data which simply haven't yet been thought of that way--like a coat hanger used to open your locked car door after you left the keys in the ignition. You could hang a coat on it, but that's not really what you need it for right now!

*Inventory of intermodal facilities:*

A final working list of "Massachusetts Intermodal Facilities" was provided to the team with two corridor maps (one for freight and one for *interregional* passengers). See also "Maps . . ." below.

*Issues:*

A two-page list of "Potential Data-Defining Intermodal Management System Issues" (e.g., potential Massachusetts doublestack rail clearance project, airport dominance issues, and so on). Also handed out: A one-page "Issue-Based Data" flowchart highlighting the objective of the IMS: "planning and designing the freight component of an IMS means defining issues, anticipating challenges and potential strategic decisions because one doesn't *need* every snippet of data--just issue-based data."). Also handed out were several trade journal articles on "hot" issues.

*Organizational instructions:*

"Introduction to ISTEAM Management Systems." Boston, MA: Executive Office of Transportation and Construction, January 26, 1994. A 17-page introduction and organizational instructions for the technical teams of all six management systems and the traffic monitoring system for highways, handed out at a technical coordinating committee meeting to all team leaders. Included was a one-page chart, "ISTEA Management Systems," showing "Work Plan Development Tasks" subdivided into two categories, "Technical Coordinating Committee Tasks" and "Technical Team Tasks."

*Other management system information:*

The IMS team leader attended meetings of two other management system teams--the Traffic Monitoring System for Highways (TMS/H) and the Congestion Management System. Also, the IMS team leader was included in all meetings of the technical coordinating committee, composed of the team leaders from all management/monitoring systems and others who could add expertise in various fields (e.g., data processing). Handouts and information from those sources were provided to the IMS team. See "Organizational Instructions" above.

**Table 2.1--Continued***Other states' and MPOs' IMS activities:*

A 19-page listing of "Other States' and Other MPOs' Experience with IMS Planning" (state-by-state index to citations showing studies, reports and other materials dealing with how other MPOs and other states are planning their IMSs and developing their IMS work plans). For example, "Traffic Monitoring System/Highways: Proposed Conceptual Structure" was a TMS/H flowchart showing output from various databases flowing first through the "TMS/H Database," then through the "GIS/Roadway Inventory," and then being distributed to the various ISTEAM-mandated management systems and other destinations.

*Maps:*

A one-page "IMS Sketch Map" showing proposed corridors in Massachusetts for IMS team discussion, February 1994. Later maps, following discussion, were produced to show shaded bands where intermodal corridors were located. The Massachusetts IMS team decided to show intermodal freight corridors on a separate map from a map with *interregional* intermodal passenger corridors. GIS-based maps were also developed to show where Highway Performance Monitoring System (HPMS) commercial vehicle (C.V.) average daily traffic (ADT) readings for the three most recent years were highest.

*Performance measures:*

Six pages of performance measure tables from the following were included in the IMS team's "February Progress Report": Ashar, A. "Performance Indicators for Intermodal Freight Terminals." Unpublished manuscript. Arlington, VA: National Ports and Waterways Institute, August 1993. A chart of potential performance measures for Massachusetts IMS team discussion was also distributed.

*Progress reports/minutes of meetings:*

Monthly progress reports, periodic status reports on certain tasks, and minutes of meetings where it was particularly important to have a written record of team members' discussion (e.g., when the final corridor and intermodal facility lists were discussed) were prepared and distributed to the team.

*Research:*

Between IMS team meetings, several members performed research to develop data on certain transportation modes. The IMS team leader provided data on the trucking industry in Massachusetts in two manuscripts:

"Major For-Hire Trucking Clusters in Eastern Massachusetts," February 1994. A map and two pages of text to provide detail for the trucking subheading within the "Major Massachusetts Intermodal Facilities" list.

**Table 2.1--Continued**

"High Trucking Activity Towns in Massachusetts: Results of a Preliminary Analysis," March 1994. A 13-page manuscript including tables of trucking-related data for Boston-region MPO towns and a location map of towns deemed to have high trucking activity based on Massachusetts Business Directory listings of headquarters and terminals of for-hire trucking companies of all types (general freight, liquid and dry bulk, etc.).

*Resources needed to develop the work plan:*

A memorandum was submitted listing budgetary, personpower, and equipment needs anticipated to develop the IMS work plan. However, since most data are in the private sector and since the Freight Advisory Council hadn't yet been implemented, costs had to be estimated very roughly.

*Tasks for the technical team:*

"Intermodal Management System Technical Team Tasks," a 13-page highlighting of issues and questions the IMS technical team should address; reference is made to sections of the Interim Final Rule in the December 1, 1993, Federal Register (pp. 63442-63485).

## 2.6 What are the coordination challenges with other management systems and MS teams?

Ultimately the six management systems will form one integrated system. Therefore, each of the individual systems and their representatives need to be aware of developments in the other MSs. The IMS particularly needs coordination with other MSs because it is the newest and because intermodalism means "between ways" of transportation.

Certain of the MSs are asset, equipment, or facility management systems. These include the Pavement Management System (PMS), the Bridge Management System (BMS), and the Public Transportation Facilities Management System (PTMS). The other three management systems are *performance management systems*. These include the IMS, the Safety Management System (SMS), and the Congestion Management System (CMS).

Coordination between development of the CMS and IMS is perhaps more important than any other inter-management-system coordination, and would be even if it weren't required by the Interim Final Rule (p. 63464). "Section 500.505(g) requires coordination of development, establishment, and implementation of the CMS with that of the PTMS and IMS." It is up to the IMS team to "determine the coverage and applicability of...these three systems with regard to system performance." FHWA and FTA "intend that the cooperating agencies determine what aspects of people and goods movement will be covered by each of these systems."

"Several commenters noted that the IMS addresses two diverse issues, freight and people movement. The States have the flexibility of structuring the IMS to address the intermodal transportation issues of freight and people movement separately. The states may decide to include intermodal people movements within the CMS" (p. 63468). Massachusetts had included all freight and *interregional* passenger movements in the IMS; transit transfers and other intraregional intermodal passenger movements are in the CMS.

An additional important distinction can be made among the SMS, CMS, and IMS--*the IMS is the one performance management system with a dearth of freight intermodal databases in the public domain*. Because much of freight intermodal transportation is in the private sector, the important databases are there. The IMS doesn't have the "leg up" that the other MSs have--online data in the public domain.

Because most IMS freight data are in the private domain, it is particularly important for the IMS to develop a strong outreach and private sector involvement component. Typically this takes the form of a Freight Advisory Council or group that includes representatives from the private sector (transportation companies, associations, and organizations of all kinds and from all modes) meeting on issues of mutual concern and sharing data that can be used for the common purpose--better planning of transportation facilities and the interfaces among them.

## 2.7 How do I organize and implement a Freight Advisory Council to get the private sector transportation companies involved?

The December 1, 1993, Interim Final Rule points out how important involvement with the private sector is for intermodal management system development: "The IMS system should include all facilities, both public and private, necessary to establish an efficient intermodal transportation system. **An effective IMS must consider private sector issues.** Many capital decisions affecting transportation facilities and systems are made by the private sector. Government policies and programs can also have a powerful impact on private sector operations and decisionmaking" (p. 63468).

The Interim Final Rule discusses "public involvement" (p. 63449) primarily with passenger, not freight, transportation in mind. For example: "The intent was that the public be informed of the assumptions (e.g., performance measures) and procedures underlying the systems and have the **opportunity for involvement** in the implementation of the results of the systems." Little is mentioned of the **private sector company involvement** that is so critical to the development of the freight component of the IMS.

IMS team leaders should prepare a list of freight-related associations, organizations, agencies, and individuals. After senior management review of that list, a letter of invitation can be drafted. The FAC is an **issue- and data-gathering** resource group with a workable number of members. The council should be a one-stop-shopping opportunity for private sector representatives. They will be kept informed about and will have input into such projects as the IMS, the revised state rail plan, the state aviation plan, regional plans, and the statewide transportation plan. Issues of mutual concern can be discussed, data sharing mechanisms can be initiated, and solutions can be planned.

The reader is referred to IMS planning activities in other states and MPOs which have Freight Advisory Councils or similar private sector involvement groups implemented already. These include the San Francisco Bay Area's Metropolitan Transportation Commission, which has received valuable issue input from the private sector members of its Freight Advisory Council. Other councils are operating in Ohio (see "Access Ohio" in the List of References), Portland, Oregon, and the Twin Cities (Minneapolis and St. Paul, MN), to mention just a few.

### 3. ANSWERS TO STATE AND MPO QUESTIONS ABOUT IMS DATA AND DATA ANALYSIS ISSUES

#### 3.1 How will emphasis on "issue-based data" narrow my data search?

The world is too complex to understand without some simplification. When transportation professionals use models and theories to try to understand transportation interrelationships, they make assumptions to simplify complex reality for a time. In everyday life we set priorities to get things done in the time allowed.

Especially because freight intermodal and interregional passenger data are primarily in the private sector, some narrowing of our data needs is necessary. We would never have the time, manpower, or budget available to acquire or collect all the data a perfect IMS would need. We need some device to prioritize what can be obtained.

Each state or MPO has its own important transportation issues--"hot button" projects, bottlenecks that need fixing, consultant reports underway. Although we need to plan to be *flexible*, the concept of collecting *issue-based data* for the IMS is a useful one not only to narrow down the search but also as a frame of reference of how the data will ultimately be used to provide a foundation for strategic decisions. (See Fig. 3.1.)

The IMS should represent the intermodal issues that are important. An inland state without water transportation will not need to collect waterborne commerce data. A state with expansion at certain airports may concentrate only on air freight data for certain airports. A region with a military base that will be converted to a transportation purpose will need intermodal data for that development. And a state where doublestack rail issues are "hot" may prioritize its data search within certain corridors for truck and rail flow data.

The device of highlighting issue-based data is not new or revolutionary, but it is useful. An IMS team that says it wants to collect anything and everything without thinking how the data will ultimately be used--or indeed if the data will ever be needed and used--is an inundated, lost IMS team. The team must decide on what are regionally important issues and highest priority data needs. Only by prioritizing the data search within certain issue areas can an efficient data search process be maintained.

Avoiding the issue-based data approach could mean that issues are defined by the choice of data rather than *vice versa*--and that some issues are eliminated summarily because of data choices and not because of their regional importance.

The IFR encourages issue identification: "States and local agencies are strongly encouraged to identify their intermodal transportation issues and determine the type and level of data that are necessary to address these issues as part of their IMS" (p. 63467).

**The IMS team must identify the intermodal issues before defining its data needs!**

For example, incident management on the highways is an important issue which involves many management systems and requires the collection of particular types of data. Potentially all six management systems and the traffic monitoring system could be affected by car-truck/truck-car incident management planning. The SMS and CMS are most directly affected, and the TMS/H monitors highway traffic of which incidents are a part. Indirectly there is an effect which is important to consider in the PMS (involvement of pavement factors in the incident; pavement damage as a cause or result) and perhaps the BMS, depending on the location of the incident (if it is on or near a bridge). There may be overflow onto public transit facilities because of certain highway incidents, so the PTMS could be affected. Even the IMS is involved or could potentially be involved. If truck/rail intermodal flows were increased, that might remove some truck traffic from the highways, reducing the exposure to possible future incidents. Knowing that incident management planning is an **important issue** suggests a **data need**--for incident-level truck flow data by commodity, vehicle type, and other categories.

However, **knowing what data are needed doesn't mean data are available** or even obtainable. Certainly no GIS-based truck flow database exists in MPO-level form. The 1993 Commodity Flow Study being carried out by the U.S. Bureau of the Census will not be available until 1995 and will be used for national analyses. There are 89 regions (National Transportation Analysis Regions [NTARs]) within which the origin/destination data are aggregated. That will not provide reliable truck flow data for many small states or at the MPO level.

The Interim Final Rule states that "the FHWA and the FTA believe that much of the data is currently available although it may need to be compiled in a format more useful to the management systems" [p. 63446]. That may be true for the PMS and BMS, for example, but "currently available" doesn't accurately describe data availability for the IMS.

**Figure 3.1**  
**Issue-Based Data Needs**

Planning and designing the freight component of an intermodal management system means defining issues and anticipating challenges and potential strategic decisions--because we don't need every snippet of data--just issue-based data.

**ISSUES / POTENTIAL STRATEGIC DECISIONS**

**DATA / DATABASE NEEDS**

**DATA MODELING NEEDS**

**REGIONAL / STATEWIDE  
PLANNING MODELING**

**MAKE STRATEGIC DECISIONS  
FOR  
FINAL PLAN/T.I.P.**

Fig. 3.1--Continued

**Issues of Importance in Massachusetts Intermodal Planning**

(Issues that Set Data Needs Boundaries; Issues that Suggest Strategies/Strategic Decisions)

**Physical Limitations**

- Structural vertical clearance for doublestacking
- Ease of access to intermodal facilities
- Bridge weight restrictions, availability of access roads for truck drayage (truck/rail, truck/port)

**Transferability and Coordination**

- Movement interference between modes at highway-railroad & highway-waterway crossings
- Congestion and delays created by drayage (to/from truck/rail and truck/port facilities)
- Interregional passenger transfer delays between modes
- Highway-ferry boat transfer delays

**Economic & Environmental**

- Economic tradeoffs between modes and combinations of modes
- Air, noise, and wetland impacts of intermodal facilities
- Fort Devens reuse/new intermodal facility
- Economic impact of railroad abandonment
- Econ. impact on truckg./drayage/related industries from major changes in port/rail container traffic

**Delivery and Collection**

- Interregional passenger feeder systems to intermodal facilities
- Land-side access to airports and ports
- Freight delivery at major centers of activity
- Truck delivery and loading interface w. street traffic-peak/off-peak delivery
- Flow disruptions as Central Artery/Tunnel Project moves toward completion

**Safety**

- Highway-railroad crossing safety
- Truck-involved incident management on highways
- Hazardous materials shipments

**Legal & Regulatory**

- User fees and subsidization of transportation modes
- Truck route restrictions/weight limitations

**Accessibility**

- Accessibility time & cost to intermodal facilities
- Designated truck routes

### 3.2 What kinds of data?

The Interim Final Rule points out (p. 63446) that "data collected will differ between regions and states. The FHWA and the FTA believe that the Congress intended that the management systems be used by State and local officials to aid in decisionmaking and not for establishing a nationwide data base for use by the [U.S.] DOT for either peer comparisons or to meet its internal data needs. The FHWA and the FTA do **not** believe that **mandating standardized data sets** is either necessary or warranted. This function can be better served by **other mechanisms**, such as the FHWA's Highway Performance Monitoring System (HPMS), FTA Section 15 data, and the newly established Bureau of Transportation Statistics" (highlighting added).

Data for intermodal purposes are basically of three types (specific databases and data sources are itemized on the following pages):

**You have it:**

- Available freight traffic, flow and facility data online or in hard copy within agencies
- Recyclable data--data collected for other purposes which can be used for the IMS.

**You don't have it, but you can get it:**

- Available data acquired from outside (consultants, data suppliers, etc.)

**You don't have it yet (and may never):**

- Newly collected data--trucking company surveys, automatic traffic recorder (ATR) placement plans, consultants brought in to develop new flow or facility characteristics data, etc.
- "Druthers data"--data that you'd like to have if you had your "druthers," but that might realistically be unavailable (too much money, personpower, time, etc.)

The reader is reminded that in the case of "druthers data," it is particularly important to heed the message mentioned above (Section 3.1): The IMS team must identify the intermodal issues before defining its data needs! Including unneeded, issue-unrelated data on a work plan "wish list" would only consume available personpower, budget, and time resources unnecessarily. Resources would not be available to acquire or develop other more easily accessible types of data.

An "Intermodal Database Description Form" (Table 3.1) that has been used by the Massachusetts IMS is shown here as an example of the type of information to be collected on each database that is available or becomes available.

**Table 3.1**  
**Intermodal Database Description Form**  
**(Metadata)**

**Name of IMS-related Database:**

**Database Manager, Organization/Agency, Phone:**

**General Description and Purpose of Database:**

**Geographic Area of Coverage** (e.g., statewide, MHD jurisdiction, etc.):

**Platform** (e.g., 486 PC, Sun UNIX workstation, VAX, index cards, etc.):

**Where Is Platform Located?**

**File Formats/Software Used** (e.g., dBase IV, ASCII, INFO, Excel, Lotus, etc.)

**Subfile Descriptions** (e.g., HPMS universe records, etc.):

**Current Plans for Improvement:**

**Describe Primary Sources of Information Used and Collection/Updating Methods:**

**Frequency of Update:**

**Data Source** (e.g., ATRs, bill of lading, etc.) & **Entry Unit** (RPAs, Registry, etc.)

**Describe the Geographic Referencing System Used for the Data**  
 (e.g., route/milemarker, state plane coordinates, latitude/longitude, etc.):

**If GIS-based Database, What GIS System?** (Arc/Info, MapInfo, etc.)

**List Principal Users/Types of Users of the Data and Data Use:**

**Products/Major Publications/Reports:**

**Record Unit** (e.g., 5-axle truck, trucking co., pipeline station, rail/truck I/M facility, etc.)

**Number of Records:**

**Specific Items/Data Elements/Fields of Information Contained**

**Remarks:**

**This Form Completed by:**

**Date:**

### 3.3 Where do I get data? What organizations, groups, directory publishers and other sources can I use?

The easiest avenue of IMS database development is to use or reuse already available data. Some IMS-related data you already have within your MPO or state agencies may have eluded you because you didn't think they were usable for freight intermodal purposes. Agencies should check their files for special-purpose automatic traffic recorder (ATR) counts, for example; they may be a rich source of near-intermodal-facility traffic information. Here are a few of the *readily available* data sources that Massachusetts has used to good advantage for intermodal management system work plan development:

These useful sources can be found in most transportation libraries (see List of References for complete information):

#### *Associations*

Many associations provide valuable information, among them:

American Trucking Associations, Alexandria, VA

Association of American Railroads, Washington, DC

Intermodal Association of North America, Riverdale, MD

(Check Gale's Encyclopedia ... [Detroit, MI: Gale Research] for many others)

#### *Atlases*

Several atlases are useful, such as Rand McNally's Handy Railroad Atlas of the U.S. (Chicago: Rand McNally, latest edition).

#### *U.S. Bureau of Census*

The U.S. Bureau of Census' County and City Data Book (latest edition) and County Business Patterns (CBP) database can be used to develop county-to-county freight flow estimates. CBP number-of-companies data can be multiplied by average truck or rail costs or average tons to get aggregate estimates. The U.S. Bureau of Census' 1993 Commodity Flow Survey, which will provide origin/destination matrix data but only at the National Transportation Analysis Region (NTAR)-to-NTAR level. All of Massachusetts fits into two of the 89 NTARs (Numbers 4 and 6) in the country, and the Boston MPO region is within NTAR Number 4. NTARs are aggregations of Bureau of Economic Analysis (BEA) regions. The U.S. Bureau of Census' CBP data provides some ability to generate flow data at the county-to-county level, but in New England the county is less important as an organizing entity for transportation data than are towns, cities, and traffic analysis zones; therefore, the potential of CBP is minimal for intraMPO planning. Another useful database the Census produces is the Truck Inventory and Use Survey (TIUS); at this writing (May 1994) only 13 state 1992 TIUS reports have been issued. (The issue for Massachusetts won't be out until fall 1994.)

### *Companies*

Direct contact with major transportation companies in your region is highly recommended, since most intermodal data reside in the private sector. Major rail, trucking, shipping, and other companies are listed in many of the directories mentioned below.

### *Consulting firms*

Several consulting firms, research institutes, and foundations may be able to develop flow data from already existing databases they have or through surveys of trucking companies:

Reebie Associates' (Greenwich, CT) *Transearch* database

DRI/McGraw-Hill's (Lexington, MA) *Freightscan* database

ATA Foundation (Alexandria, VA) trucking company survey data

### *Corps of Engineers, U.S. Army*

For waterborne flow information, check the regional office of the U.S. Army Corps of Engineers, which is responsible for compiling and publishing the authoritative source, Waterborne Commerce of the United States, each year.

### *Directories*

Directories of associations, organizations, and businesses are an extremely valuable source not only of contact information for use in organizing your Freight Advisory Council but also as potential providers of data. In Massachusetts, these are a few of the ones we use:

#### *American Business Publishers:*

State directories are published by American Business Publishers (ABP) of Omaha, Nebraska. Using Standard Industrial Classification (SIC) code data, they put out very detailed directories for each state and even for particular categories of business. ABP's Massachusetts Business Directory provided a fine-grained listing of for-hire trucking companies which could be plotted by town to highlight "high trucking activity towns" in the state. ABP takes special orders for any cross-classification of data, and the listings include address and phone number.

#### *Associated Industries of Massachusetts:*

Check for a local directory of manufacturers--for use in identifying private trucking fleets and other businesses that generate large for-hire trucking movements. In Massachusetts we use the Directory of Manufacturers published by the Associated Industries of Massachusetts in Boston.

#### *Gale's Encyclopedia:*

Gale's Encyclopedia of Organizations and Associations. Latest annual edition. Detroit, MI: Gale Publishing Company. Includes contact information on all types of associations and organizations; helpful index by various categories. Gale publishes regional encyclopedias also (e.g., Regional, State and Local Organizations. Vol. 2. Northeastern States [3rd. ed., '92-93]).

### *K-III Publishing:*

Valuable information is included in directories published by such companies as New York City's K-III Publishing. They put out these volumes:

American Motor Carrier Directory

Intermodal Reporter

Official Intermodal Directory

Official Intermodal Equipment Register

Official Intermodal Guide, Fall/Winter 1993

Railway Line Clearances

Warehousing/Distribution Directory

Official Intermodal Directory's Massachusetts section lists a few of the major rail/truck-truck/rail intermodal facilities and some of the major truck terminals but doesn't, for example, include such facilities as tank farms (pipeline/rail/truck intermodal), air freight terminals, and other intermodal facilities. No passenger intermodal facilities are included.

*Northeast Directory of Transportation Services ("DOTS") (or similar directories in other regions):*

Northeast Directory of Transportation Services. Boston, MA: Northeast Journal of Transportation, 1993/1994. (617) 695-1660.

### *Phone directories:*

They provide valuable and very current listings of associations and businesses. Do not overlook this source because it is not designed and organized exactly for your intermodal management system purpose! This is a particularly good source for locations of drayage companies, the population of which might change frequently.

### *Shipping associations:*

Your local shipping association's handbook will have valuable information. For example, the Port of Boston Handbook is put out by the Boston Shipping Association. Check the business pages of your phone book or a local/regional directory for address and phone number.

### *Thomas Directory:*

The Thomas Directory Company/Thomas Publishing of New York City has a series for the nation ("green books") and for many regions (e.g., "orange books" for Eastern New England) that provide company (all types) listings, including contact information. Thomas also publishes Inbound Traffic Guide Directory: Complete Handbook of Intermodal Facilities and Services, an annual publication.

### *TruckSource:*

TruckSource (latest edition) is put out by the ATA Information Center (703/838-1880) of the American Trucking Associations, Inc. It lists valuable contact information for trucking industry groups and associations and it includes a bibliography of major reports and studies on a wide variety of trucking issues.

### *Highway Department, State*

Your state highway department's traffic volume publications provide some helpful data. Also, truck counts previously done for routine or special studies offer potential. Special counts with vehicle classification and regular HPMS counts with vehicle classification offer some raw ADT flow indications. Deployment of automatic traffic recorders (ATR) for special counts in and around intermodal facilities is always an option, although a more expensive one.

### *ICC Rail Waybill Statistics*

The Carload Waybill Sample is produced by the Interstate Commerce Commission (James Nash; 202/927-6196) and includes information from an annual stratified sample of waybills for large railroads (those which terminate over 4,500 cars per year--95 railroads in 1991). The Public Use File contains nonconfidential railroad traffic flow data; movements are aggregated to the BEA-to-BEA level at the 5-digit level of commodity detail. Federal and State agencies and consultants working for them can request the confidential version of the database which includes, for each move, the following information: carloads, tons, waybill revenues, car-miles, ton-miles, length of haul, each railroad involved in the movement, and interchange locations. Nearly 60% of all this traffic (5.5 million carloads) in the 1991 database moved under the Miscellaneous Mixed Freight category; therefore, the actual commodity is not identifiable for a significant proportion of traffic.

### *Institute of Transportation Engineers*

Institute of Transportation Engineers' latest Trip Generation manual can provide multipliers (land use type 030, for example, is for a "truck terminal" and includes intermodal facilities). MPOs and states are advised to use studies from your own region if possible; the rates in the ITE manual for land use type 030 are based on two early 1970s studies in California. (See Tadi and Balbach (1994) for recent work on truck trip generation rates.) Also a good source is the Institute of Transportation Engineers' Transportation Planning Handbook (1992), which is an anthology of articles on particular transportation subjects. Chapter 2.7 covers "Goods Movement" on p. 64 and Chapter 7 (pp. 201-293), "Transportation Interface Areas," provides excellent coverage of intermodal topics and has useful intermodal facility diagrams.

### *Port Import/Export Reporting Service (PIERS) Data*

PIERS is a maritime industry flow database maintained by the Journal of Commerce; it can be used to develop intermodal container flow statistics for particular corridors. As an example of how it is used by IOC, the trade paper recently reviewed a 1993 Bank of Boston report, "New England Exports: Where Do We Go From Here?" The reporter noted that it "gives clues as to why New England's economic recovery has lagged behind the nation's: Businesses are not fully taking part in exports to potential trading partners in fast-growing Asian and Latin American countries" (Journal of Commerce, 12/21/93). PIERS data used for and cited in that 12/29/93 IOC article show that Boston is the 25th-ranked port in terms of October '93 "box traffic" and tied for 19th (with Baltimore) when ranked by the percent change in box traffic, '93 YTD (Oct.) to '92 YTD (Oct.). Honolulu

(HI), Manatee (FL), Wilmington (DE), Fernandina Beach (CA), and Gulfport (MS)/Mobile (AL) are the top 5, ranked on the latter measure.

### *Studies (in Your Region) Completed Previously for Other Purposes*

Completed special studies whose freight data can be used for intermodal planning purposes and studies designed especially for IMS purposes are two options. Some states and MPOs have hired consulting firms to generate freight flow data (e.g., NJDOT and Portland, OR, use DRI/McGraw-Hill [Lexington, MA] data) and some MPOs have arranged for special surveys by arms of trade associations (e.g., the American Trucking Associations Foundation's (ATAF) regional office in Rumford, RI, performed a truck company survey for the Worcester [MA] MPO). In Massachusetts, the availability of already underway or completed special studies will be helpful in providing access to freight and/or truck flow data in this region (see "List of References" for full citations): Bechtel/Parsons Brinckerhoff, 1994, Bechtel/Parsons Brinckerhoff and Cambridge Systematics, Inc., 1992a and 1992b, Boston Transportation Department, 1987, Cambridge Systematics, Inc., and ATA Foundation, 1992, Simat, Helliesen & Eichner, Inc., 1991, and Truck Trip Generation Rates... by CTPS, 1993.

### *Trade Journals*

Several trade journals and newspapers have useful facility and corridor information:

American Shipper

Journal of Commerce

Northeast Journal of Transportation

Transport Topics

Traffic World

World Wide Shipping Guide

### *Trucking Industry Sources*

American Motor Carrier Directory (K-III Publishing)

American Trucking Associations' Motor Carrier Annual Report, latest issue (for financial and operating data on large trucking companies in your region)

Transportation Technical Services' Blue Book

Transportation Technical Services' National Motor Carrier Directory (trucking/draysage company contact information)

Truck Inventory and Use Survey (See "Census..." above)

### *Universities and Research Institutes*

Local/regional university libraries and research institutes (e.g., a Center for Transportation at a nearby university) have specialized sources and students pursuing their masters or doctorate whose theses and dissertations may provide IMS corridor and facility inventory data and ideas for IMS work plan development.

### 3.4 Important State and Regional Data Sources

Although truck flows are a minor component in MPO regional planning models at present, urban goods movement studies carried out by consulting firms and by agency staff are often of particular use in IMS planning.

States and MPOs should use the data resources of other ISTEA management systems. Checking agency files for the results of special studies may be productive; while not originally designed for intermodal purposes, their results may be valuable for the IMS.

Several other types of state and regional data sources are probably available:

- Traffic/vehicle counts from permanent count stations and coverage count stations (e.g., 48-hour counts) are available from the highway agency that maintains Highway Performance Monitoring System data for submission to FHWA.
- Vehicle counts from the highway department's weigh-in-motion (WIM) scales.
- Detailed turnpike authority traffic data, often in detailed vehicle categories.
- Automatic vehicle identification (AVI) systems maintained by some airport authorities and other agencies managing traffic to and from a particular facility.
- MPO or RPA regional planning model data--employment by industry, land use data, and zoning data, for example.
- Recent traffic and truck counts (manual or using automatic traffic recorders) made on highways in the appropriate region by MPOs or RPAs.
- Accident records used as a sample at particular locations/links/highway segments; vehicle identification numbers (VIN) allow access to vehicle detail.

### 3.5 Developing Data on Truck Facilities

What truck facilities should be included and excluded and where and how can one obtain data on them?

The Interim Final Rule (p. 63469) includes "major truck terminals." Less-than-truckload (LTL) motor carriers typically have terminal facilities in many major cities for break-bulk purposes; longhaul combination units are "broken down" for delivery (and pickup) purposes at the destination. In the *freight sense*, such a major truck terminal would not be considered an intermodal facility; however, in the spirit of CMS/IMS coordination it certainly could be considered an intermodal facility since it represents a focal point for exit/egress of trucks from/onto the potentially congested highway system. Certainly rail/truck intermodal facilities such as Beacon Park, Conley Terminal, Moran Terminal, Fort Devens, and others in Massachusetts need to be included in the IMS.

Do we wish to include "major truck terminals" where *goods* are transferred *intramodally*? The Interim Final Rule does indeed say that "only those data items deemed to be essential to operation of a basic management system are specifically required by the regulations" (p. 63446).

The Interim Final Rule frequently mentions "flexibility"; if the IMS team chooses to, it could simply exclude "major truck terminals" from the IMS/CMS system. But how does one define "major truck terminals"?

What about major private truck fleet locations--major manufacturers, retailers, distributors and wholesalers that maintain their own large fleets? Should those "major truck terminals" be included in the facility inventory?

#### 3.5.1 Designing a Truck Company "Commodity Flow" Survey

The state or MPO may decide to collect data directly from transportation companies, like trucking companies, through the design and administration of a concise survey. One of the main objectives of such a survey should be to obtain truck flow data categorized by major commodity groups. What and how much is moving in those trucks through your region?

The state or MPO could collect truck flow data from a trucking company survey without outside help. Although consultants, association foundations, and others could be hired to design and administer the survey, agencies could do it themselves. A drawback is the potential low return when private companies (for-hire trucking companies, manufacturers/retailers with their own fleets of trucks) see in their "in box" yet another survey from a pesky public agency.

When designing the questionnaire or survey form, it is suggested that no more than one two-sided page be used. One side could be an origin-destination matrix within which the

respondent would provide average annual ton-miles, number of trips, or a similar summary measure.

Where do you look to get a trucking company mailing list? Let's say you want a contact list for all for-hire, private, and drayage companies with terminals or headquarters in your region. Certainly truck/rail intermodal activity moves across state borders, so be sure to include major national and regional carriers even if their headquarters are not in your state.

Developing a reasonably comprehensive list of trucking companies is often a good project for summer interns at your agency. Here are some sources of contact information in your state:

American Business Publishers, Omaha, NE, can produce tables by SIC code for a price or you could order their directory for your state or region (e.g., Massachusetts Business Directory)

American Trucking Associations' (ATA) state association in your region

American Trucking Associations Foundation (ATAF) national (Alexandria, VA) or regional office

Associated Industries of [your state], or similar association, that publishes a Directory of [Your State's] Manufacturers

Association of American Railroads members in your region

Intermodal Association of North America (Rockville, MD) members in your region

Intermodal Council of the ATA (Alexandria, VA)

K-III Publishing's (New York City) Official Intermodal Guide and their American Motor Carrier Directory

National Private Truck Council (NPTC) (Alexandria, VA) members in your region

Northeast Journal of Transportation's Directory of Transportation Services

Port Carriers Council or similar organization of drayage/intermodal haulers servicing the port facilities in your region

Shipping Association for your region (e.g., Boston Shipping Association publishes Port of Boston Handbook)

Thomas Directories (New York City) for your region

Transportation Technical Services' (New York City and Fredericksburg, VA)

National Motor Carrier Directory and their Blue Book

Since what we really need from the survey is traffic flow information, survey designers should plan to ask for responses in a chart or matrix with transportation zones arrayed along the borders. Figure 3.2, "Trucking Company Survey O/D Matrix," is an example.

**Figure 7.1**  
**Origin/Destination Matrix for**  
**Trucking Company Survey**

**Major Commodity Group for This Matrix:** \_\_\_\_\_  
**INSERT NUMBER OF TRIPS PER TYPICAL '94 WEEK**

[Routes to] Destination States (Using Mass. Interstate Rtes. as Examples)							<i>Inside Massachusetts</i>	
Origins:	91/84/to CT	90/to NY	95/to RI	95/to ME	93/3/to NH	91/7/to VT	MPOs/RPAs traffic analysis zones (several columns)	Particular intermodal facilities (several columns)
<i>Outside MA</i>								
Rte. 91/84/from CT								
Rte 90/from NY								
Rte. 95/from RI								
Rte. 95/from ME								
Rte 93/3/from NH								
Rte. 91/7/from VT								
<i>Inside MA:</i>								
MPO's/RPA's								
traff. analysis zones (several rows)								
Particular intermodal facilities, e.g.:								
Beacon Park								
rail/truck								
Conley Terminal								
water/rail/truck								
Fort Devens								
rail/truck								
(etc.-several rows)								

**NOTE:** Respondents could fill in number or proportion of total trips, number or proportion of total tons, and other possible variables. PROVIDE 3 MATRICES, ONE FOR EACH COMMODITY.  
 Ask for responses for just the TOP THREE COMMODITIES for each respondent.

Make sure that major intermodal facilities are included as centroids of special zones. Include major origins and destinations beyond your borders.

As an alternative to asking for average annual data (e.g., ton-miles, number of trips), survey designers could ask for the number of (or percent of total) trips per *typical* week or month. The respondent would complete up to three matrices--one for each of the three most important commodities his company regularly (typically) transports. Although a week or a month does not accurately represent all movements in the year, trucking company respondents will remember and provide more accurate data for a shorter time span.

The bottom line for transportation agency survey designers is that they need traffic-assignment-type data for highway freight and other movements to load onto the GIS-based regional model network. Sporadic responses from a few of the many carriers won't do. Comprehensive truck flow data are needed, at best, but a good fallback position would be to select a random sample from the comprehensive trucking company mailing list once that has been developed.

Stress the need for flow data from respondents, but ask the company about transportation issues it thinks are important, bottlenecks in the transportation system, and other issues. The survey is a way of developing user-based information for IMS planning.

### **3.5.2 High Trucking Activity Towns in Massachusetts: Results of a Preliminary Analysis**

As a "first cut" at the question of where trucking activity is most intense in Massachusetts, the IMS team leader performed a preliminary analysis based upon readily available business directory information about the *for-hire trucking companies* located in the state.

The source of data was the 1990-91 Massachusetts Business Directory (published by American Business Publishers of Omaha, NE), one of a number of similar sources that could have been used to find home office locations of trucking companies. The clustering was done by the team leader using back-of-the-envelope "nearest neighbor analysis" for all locations of for-hire companies listed therein.

How much trucking activity is missing? The team leader compared Massachusetts Business Directory information, a trucking company list prepared for one regional planning authority region, and GIS output from another regional planning region, the latter containing private trucking locations as well as for-hire locations. One third of the latter RPA's total was in the private trucking category; if that holds true for other regions in the state, any map of high-trucking-activity towns based solely on for-hire trucking company information is probably showing us *only two thirds of the real trucking activity picture*.

Another type of data was provided through Massachusetts' Traffic Monitoring Systems for Highways (TMS/H) team. Federal Highway Administration Highway Performance Monitoring System data for 1990, 1991, and 1992 were provided--data on commercial vehicle average daily traffic for peak and off-peak hours. Commercial vehicles included categories 4 through 13--buses (4), single-unit trucks (5-7), four-or-less-axle combination units (8), and five-or-more-axle combination units (9-13). Data were provided for 350 48-hour vehicle classification counts representing approximately 85-90 counts per year at coverage count stations in Massachusetts.

Both the above data sets were used to develop the list and the map of "High Trucking Activity Towns" for the Commonwealth. Mixing the two types of data (number of for-hire trucking companies and HPMS readings) makes the coverage more comprehensive. Towns with high HPMS readings are often "*through towns*" in less populated areas rather than "*to towns*" like many in the Boston MPO region with trucking company headquarters or terminals.

Refinement of measures and a more comprehensive list is something that will be needed later. One important refinement, for example, would be to include more information on the trucking industry and trucking company locations. A great deal remains unknown about trucking activity at the state and MPO levels.

How many trucks are operated? What vehicle configurations and combination units operate? What commodities do they carry? What are the origins, destinations and trip lengths? What are the operating revenues and expenses? How big is the company (number of employees/drivers)? Certainly a map and table showing high trucking activity based only on the number of company locations (dots) without any information on the characteristics of those companies and locations (size of dots) will be different than a map and table based upon more complete information. However, to obtain such information a survey of companies, flow data provided by trucking companies, or a field land use survey would be necessary. These are topics best taken up with the Freight Advisory Council, whose private sector representatives control most of the freight data that exists.

### 3.6 Developing a GIS-based System

Use of a geographic information system (GIS) **is not mandated** by the Interim Final Rule. The rule (p. 63448) states that "several [NPRM] commenters expressed concern about the requirement that the procedures include the use of data bases with a common or coordinated reference system," which was included "to avoid the duplicative collection of data that would be used by more than one system." "One commenter believed that this would require the use of a geographic information system." The Interim Final Rule makes it clear, however, that that requirement "does not mandate a specific type of data base or reference system."

The Boston MPO's Central Transportation Planning Staff and several state agencies use the Arc/Info GIS, which will be the basis for the IMS and CMS reference systems. The majority of links in the potential IMS reference system are already in CTPS' GIS system. The National Highway System (NHS) is included and the rail system is included. Surface facilities in the air freight system are online because of a recent CTPS mapping project for Massport's Aviation Division using Massachusetts Aeronautics Commission data. All major and minor airports are located on the system (not all of which will be important air freight intermodal facilities).

What remains to be entered into the GIS reference system, if the IMS team so desires, are such items as these:

- Links to major intermodal facilities (that are not now in GIS) and the facilities:
  - Rail/truck-truck/rail facilities like Beacon Park (Conrail) and Fort Devens (B&M)
  - Water/rail/truck facilities like Conley Terminal and Moran Terminal
  - Air freight terminals within major airports (Logan Airport)
- Pipelines
- Major canals and portions of the Intracoastal Waterway

### 3.7 What can consultants do for me? What can't they do?

Some states have opted for hiring consultants to do their IMS work plan. However, as one member of Massachusetts' IMS team has said, the "product is the process," and the product of the IMS is an *ongoing inhouse process and structure* that can't be completely satisfied by outside consultants. Consultants can often provide ongoing data sources to be used by state and MPO agencies, but the agencies must use the data themselves and implement a smooth process for incorporating databases developed outside.

It is important, if consulting services are used, to use them constructively to *supplement* interagency IMS activity and not to *supplant* it. Consulting firms have many advantages, not the least of which is fast turnaround time. What may be difficult to get done in a short amount of time in a multi-agency framework can be done quickly by many consulting firms. Once the firm is brought "up to speed" on how the agencies operate, the agencies and consulting firm can work well together.

Consultants developing particular databases or performing specific functions can "plug" into a smoothly operating IMS structure very well. It is important to ensure that the consulting firm can provide *continuing* service to update databases since the IMS is a *process* that federal regulations require states and MPOs to actually use in the metropolitan planning process. Consultant final reports gathering dust on a shelf do not serve the IMS purpose well.

Massachusetts is developing its own IMS structure and decisions to hire outside help to develop certain database components have not yet been made. All avenues are being followed to use and recycle already available data to the fullest extent. The work plan submitted to FTA and FHWA by October 1, 1994, will include windows of opportunity for use of consulting services within the overall IMS structure.

### 3.8 Freight Forecasting and Urban Goods Movement Methods and Models in the Literature

Even though the sources listed earlier may provide valuable data, it is nevertheless true that states and MPOs have much better passenger data than freight data. IntraMPO intermodal freight planning is an afterthought in a process with a heavy passenger emphasis. As the "Intermodal Era" dawned after ISTEA, few readily available freight intermodal databases existed.

MPOs and states will need to plan for special data collection projects, acquisition of private sector databases, special surveys, and other ways to supplement what freight data are available in the public domain. Once issue-based data have been located or generated, the data analysis and quantitative modeling can proceed.

What freight forecasting and freight flow models exist at present? Are there any that are simple and easy to use for regional planning purposes?

In the scholarly and trade literature, including consultant reports, there are some discussions of and use of models for freight planning purposes. However, articles on **intraMPO intermodal** freight flow modeling and planning are definitely in the minority in the professional literature.

The key need for IMS purposes is to have **implementable models**, not disembodied theoretical models with few practical applications. What "back-of-the-envelope" techniques are there that can be used in the field for intermodal planning? What easily available data can be used for implementable models?

IntraMPO freight planning modeling is a subject for detailed discussion in the following articles and reports (see List of REferences for full citations): (A & L Associates, 1993--in California), (Arizona DOT, 1991--on the Phoenix study), (Brand, 1991--on research needs), (Cambridge Systematics, Inc., 1991--on the Phoenix urban truck travel model project), ("Intermodal Freight System Case Study: [New York - New Jersey] Circumferential Commercial Corridor," 1993), (New York State DOT's Ercolano, 1992), (Ogden, 1977), (Ogden, 1992), (Ruiter, 1992--on the Phoenix study), (Smith and Douglass, 1982), (Tadi and Balbach, 1994), (Wilbur Smith and Associates, 1969), and (Thomas, 1991).

A particular subset of intraMPO freight planning modeling studies deals with what we might call creatively modeling and recycling data from cordon line counts: (Enchenique and Williams, 1982), and (List and Turnquist, 1993).

At the statewide planning level and particularly for policy analytic purposes, the school of studies dealing with intermodal diversion models (e.g., truck/rail-rail/truck, landside access to port facilities) includes: (Cambridge Systematics, Inc., 1993 Interim Report reviews the literature on such models), (Chiang and Roberts, 1976), (Chiang, Roberts and

Ben-Akiva, 1980), (Faucett, Goettee and Kullman, 1979), (Friedlander, 1980), (Hajek, Kennepohl and Billing, 1992), (Jelavich, 1978), (Kim and Hinkle, ca. 1983), (Kornhauser, Hornung and Caudill, 1979), (Landside Access..., January 1993), (Landside Access..., July 1993), (Marcus, forthcoming 1994), (Memmott and Boekenkroeger, ca. 1983), (Meyburg and Thatcher, 1978), (Middendorf, Jelavich and Ellis, ca. 1983), (Morlok and Warner, 1977), (NCHRP Report 260, 1983), (NCHRP Report 177, 1977), (NCHRP Report 178, 1977), (Newstrand, 1992), ("Rail-Truck Intermodal...", 1983), (Reebie Associates, June 1976), (Reebie Associates, May 1976), (Roberts, 1977), (Roberts, Ben-Akiva, Terziev, and Chiang, 1977), and (Roberts and Wang, 1979).

Texts or text-like books with umbrella coverage of relevant subjects for this investigation include: (Button, 1993), (Chadwin, Pope and Talley, 1990), (Mahoney, 1985), (McKenzie, North and Smith, 1990), (Mohring, 1993), (Muller, 1989 and forthcoming 1994), (Wigan and Ogden, 1993), and (Wilson, 1980).

Mode-specific coverage of the "revolution" in the intermodal rail arena is covered by: (Awai, 1992), (DeBoer, 1992), (Leilich, 1979), (Martland, Little and Pereira, forthcoming 1994) and many trade journal articles in Traffic World, Journal of Commerce, and similar publications.

State-specific statewide planning for freight flows is the subject in the following recent studies, including the groundbreaking Access Ohio investigation that has been often cited: (Access Ohio..., 1993), (Booz Allen & Hamilton Study Team, 1993--on California), and many unpublished reports by states and MPOs that are now beginning to work on their ISTEA-mandated IMSs.

What we might call "classic" (not recent) investigations of truck flows for intraMPO freight planning (e.g., Chicago Area Transportation Study [CATS] data modeling) include the following: (Ashtakala, 1975), (Bixby and Reno, 1981), (Brogan, 1979), (Brogan, 1980), (Carroll, 1971), (Chatterjee, Wegmann, Brogan, and Phiu-Nual, 1979), (Christiansen, 1978), (Hutchinson, 1974), (Kolifraith and Shuldiner, ca. 1968), (Lim and Meyburg, 1978), (Meyburg and Stopher, ca. 1973), (Rawling [of CATS], 1986), (Rawling and DuBoe, 1991), (Rawling and Reilly, 1987), (Rawling and Ryan, 1987), (Reilly, Rosenbluh and Rawling, 1987), (Sossau *et al.*, 1978), and (Zavattero and Weseman, ca. 1982).

At the intermodal facility level, the characteristics of the facility and performance measures which indicate level of service at such facilities are the subject of some investigations: (Ashar, 1993), (Morlok, Edward K., 1992), and (Morris and Merrill, 1981). However, much of the work done in this area is in the private sector and does not get published in the professional literature.

The "List of References" attached to this report covers many types of freight planning and urban goods movement models that are or may be valuable for states and MPOs to include in their IMS planning.

### **3.9 What else is happening out there that I can use? Who has done what before? What are the other states and MPOs doing in IMS planning?**

This Guidebook is not the only current research effort dealing with intermodal freight planning and MPO issues. Other projects are identified briefly below:

The Advanced Research Projects Agency (ARPA) Maritime Technology Systems Office's (MSTO) Intermodal Transportation Simulation Initiative (ITSI), which was described in Commerce Business Daily, December 2, 1993.

There are projects at other state agencies and MPOs: Alaska, California (CalTrans and the San Francisco Bay Area's Metropolitan Transportation Commission [MTC]), Colorado (Rocky Mountain Corridor Project), Connecticut, Florida, Illinois (Chicago Area Transportation Study [CATS] and "Quad City" Study), Iowa ("Quad City" Study), Louisiana, Michigan, Montana (Shelby's intermodal plans), New Jersey (major NJDOT project involving consulting firms' work on freight flows), New Mexico, New York (NYSDOT projects and Port Authority of NY/NJ projects), Ohio (Access Ohio and Mid-Ohio Regional Planning Commission's (MORPC) Inland Port Infrastructure Improvement Program), South Dakota, Washington, and Wisconsin.

## 4.0 CORRIDOR AND FACILITY EXAMPLES FROM MASSACHUSETTS

Massachusetts' has an IMS run by the state with input from the MPOs, and not multiple IMSs for each MPO. As of April 1994, the Massachusetts IMS technical team had delimited Intermodal Freight Corridors (Fig. 4.1 and Table 4.1) and Interregional Intermodal Passenger Corridors (Fig. 4.2 and Table 4.2) as shown in the maps that follow. The team had also identified intermodal facilities within both categories, and those lists are provided also (Tables 4.3 and 4.4).

What facilities are intermodal and should be included in the IMS? A Notice of Proposed Rulemaking (NPRM) commenter quoted in the December 1, 1993, Interim Final Rule noted that "management systems should include all regionally significant facilities." In the Interim Final Rule response (p. 63447) it was noted that "the scope of coverage specified in both the NPRM and the interim final rule reflects the legislative requirements for the PMS and the BMS. The SMS covers all public roads and the other three systems [including the IMS] cover facilities appropriate to the purpose of the management system regardless of jurisdictional classification. Additional facilities may be included at the option of the involved agencies."

In other words, states and MPOs can include whatever they decide to include as a "regionally significant facility" or corridor. But they have to answer the hard question: What measure can be used to prioritize facilities and corridors and what threshold of that measure do we select (above which a facility or corridor is deemed to be "regionally significant")?

The Massachusetts IMS team discussed asserting that certain intermodal corridors are "major" or "mega." What are the *main* arteries for the flow of freight to and from regions and nations beyond the borders of the commonwealth of Massachusetts?

The team was faced with a conundrum. We didn't yet have the data upon which to base indisputable "major" and "mega" threshold definition decisions, yet we needed to delimit intermodal corridors for the purpose of knowing where to focus our data search. The team decided to identify intermodal corridors but not categorize them as "major" or "significant" until some base level of data had been obtained.

Of course, it is true that although *de jure* the team's maps do not show "major" or "significant" intermodal corridors, *de facto* they do! Simply by including some corridors and not others a *de facto* decision has been made. But no final numbers can yet be assigned to show magnitudes that will allow us to answer such a question as: "How much more significant is Corridor X than Corridor Y?" Answering that awaits the time when acceptable freight flow data are obtained. And the data are almost totally in the private sector, so without cooperation from transportation companies, answering the question would be very difficult.

One promising avenue might be to involve the private sector companies in a Delphi Process. The public agencies would identify corridors considered regionally significant and submit these for private sector consideration--in a Freight Advisory Council meeting, a mailed or phone survey, or a video conference on the subject. Expert opinion developed from knowledge of proprietary data would be brought to bear on the question without the release of proprietary data. This might please both groups and accomplish the purpose of identifying corridors and facilities of regional significance.

#### **4.1 Maps of "Intermodal Freight Corridors" and "Interregional Intermodal Passenger Corridors" in Massachusetts**

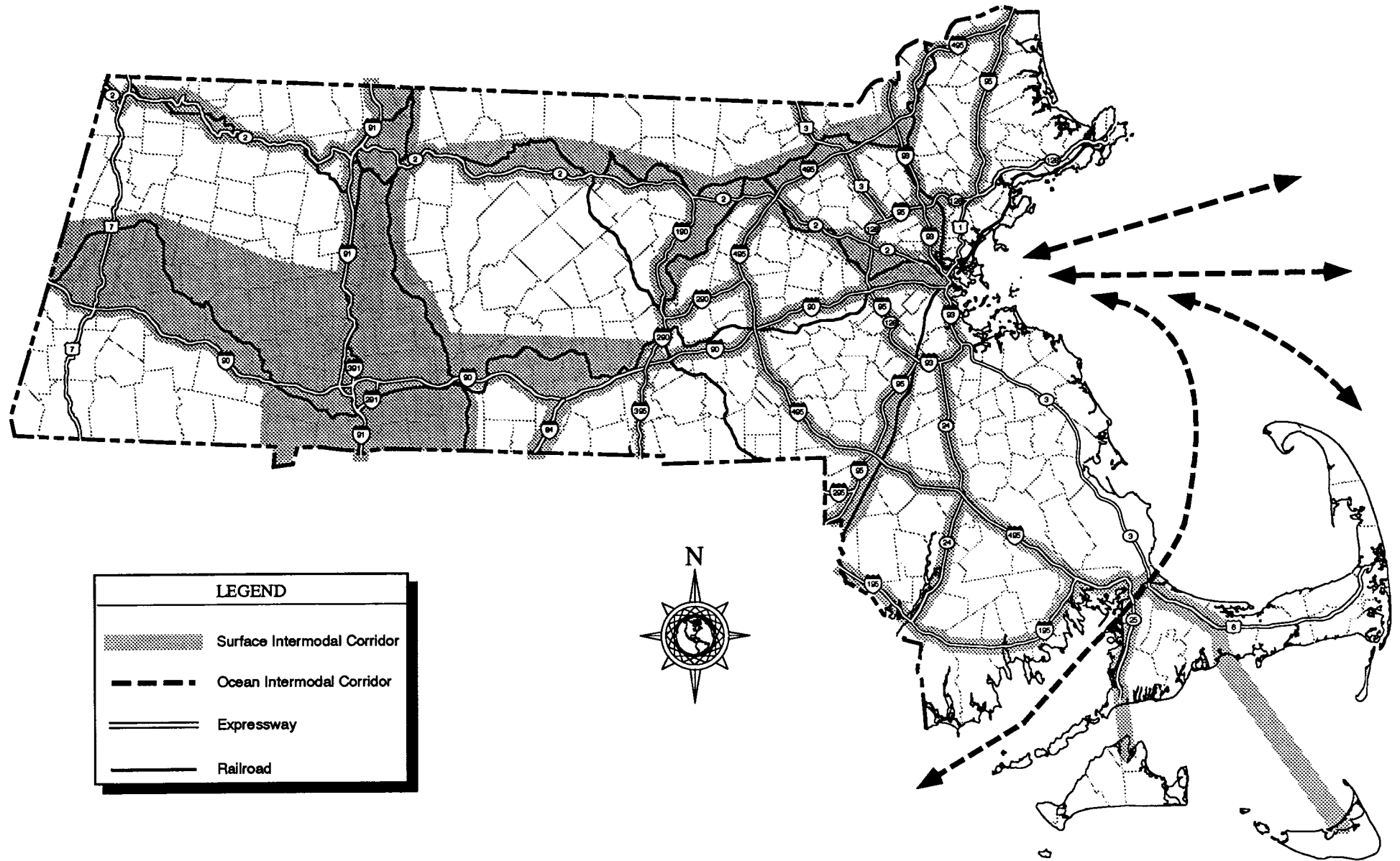
Based upon team discussion and consensus and using preliminary data, two maps were prepared for the Massachusetts IMS—one showing "Intermodal Freight Corridors" (Figure 4.1) and one showing "Interregional Intermodal Passenger Corridors" (Figure 4.2). No "major" or "mega" distinctions were made; such distinctions require more definitive freight flow data. Shaded bands vary in width not because of the magnitude of traffic in the corridor but rather because of the number and location of nearly parallel linear facilities (e.g., highways, rail lines, navigable waterways) within the corridor.

Tables 4.1 and 4.2 are lists of the Intermodal Freight Corridors (including ocean corridors) and Interregional Intermodal Passenger Corridors (including air corridors) shown on the maps. In these tables, surface intermodal corridors are identified primarily by the highway-route facility within them; rail lines and water routes are listed next. Corridors are listed beginning from the north and west proceeding eastward and southward.

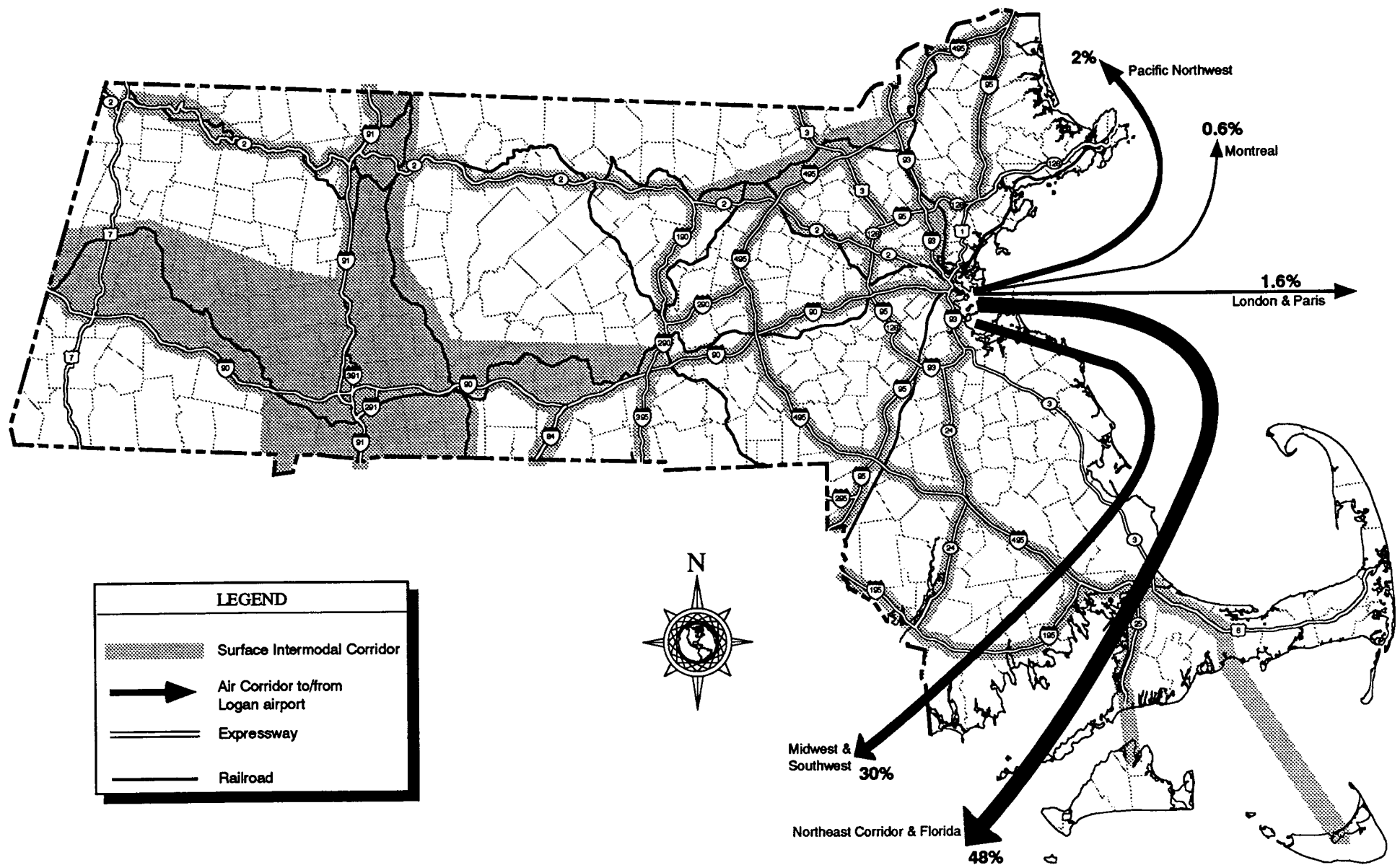
##### **Operational Guidelines for Delimiting Surface Intermodal Corridors**

- Includes major limited-access highways carrying longhaul truck traffic. (Note:  
Over 80% of Massachusetts manufactured freight is moved by trucks [ATAF data].)
- Includes rail lines identified by NETI as "regional main lines" or "secondary branch  
lines."
- High 1990, 1991, and/or 1992 off-peak or peak commercial vehicle (Categories 4  
[buses] through 13 [5-13 = trucks]) average daily traffic from available Highway Performance  
Monitoring System (HPMS) segments.
- Connects all the larger Massachusetts urban centers.
- Experience and expertise of IMS team members and other transportation  
professionals consulted.

# Intermodal Freight Corridors in Massachusetts



# Interregional Intermodal Passenger Corridors in Massachusetts



**Table 4.1**  
**Massachusetts Intermodal Freight Corridors**

**INTERMODAL FREIGHT CORRIDORS (SURFACE & ISLAND FERRIES)**

**East-West:**

Route 2/Boston and Maine Railroad

I-90/Conrail/Route 20/Route 9

I-195/Rte. 25 from I-195 to Rte. 6/Cape Cod Canal/Rte. 6 to Hyannis/paralleling railroad

**North-South/Circumferential:**

[\* = May be combined longitudinally, including I-90 from Sturbridge to Auburn, to form one corridor]

I-91/Rte. 202 (southern part)/Conn. River/Boston & Maine RR/Central Vermont Railroad

\*I-84

\*I-190

\*I-290

I-495 [\*section from Marlborough to Salisbury]

Rte. 3 (Burlington to NH border)

I-93

I-95/Rte. 128/I-295

Rte. 24

Rte. 25 (from Rte. 6 in Bourne southward) and Island Ferry Corridors (Woods Hole to Martha's Vineyard and Nantucket; Hyannis to Nantucket)

**Potential Corridors (pending receipt/acquisition of reliable flow data):**

Rte. 7/paralleling railroad

I-395

Rte. 146/Rte. 140/Providence & Worcester Railroad/Blackstone Valley

**INTERMODAL FREIGHT CORRIDORS (OCEAN)**

**East-West:**

Boston-Europe

**North-South:**

Boston-Asia

Boston-East Coast North America/Panama Canal/South America

Boston-New York via Cape Cod Canal (major barge traffic route)

**INTERMODAL FREIGHT CORRIDORS (AIR)**

(See map of passenger corridors for direction of flow arrows; data not available yet on air *freight* flow magnitude. Foreign passenger market proportions underreported because foreign carriers are not included in the FY '93 Massport statistics used.)

**East-West:**

Logan Airport-Ontario & Pacific Northwest

Logan Airport-London & Paris

Logan Airport-Midwest & Southwest

Logan Airport-Northeast Corridor & South Atlantic

**North-South:**

Logan Airport-Montreal

**Table 4.2**  
**Massachusetts Interregional Intermodal Passenger Corridors**

**INTERREGIONAL INTERMODAL PASSENGER CORRIDORS (SURFACE & ISLAND FERRIES)**

**East-West:**

Route 2

I-90/Amtrak/Route 20/Route 9

I-195/Rte. 25 from I-195 to Rte. 6/Rte. 6 to Hyannis/paralleling railroad

**North-South/Circumferential:**

[\* = May be combined longitudinally, including I-90 from Sturbridge to Auburn, to form one corridor]

I-91/Rte. 202 (southern part)/Amtrak on Central Vermont Railroad tracks

\*I-84

\*I-190

\*I-290

I-495 [\*section from Marlborough to Salisbury]

Rte. 3 (Burlington to NH border)

I-93

I-95/Rte. 128/I-295

Rte. 24

Rte. 25 (from Rte. 6 in Bourne southward) and Island Ferry Corridors (Woods Hole to Martha's Vineyard and Nantucket; Hyannis to Nantucket)

**Potential Corridors** (pending receipt/acquisition of reliable flow data):

Rte. 7/paralleling railroad

Rte. 122

I-395

Rte. 146/Rte. 140

**INTERREGIONAL INTERMODAL PASSENGER CORRS. (OCEAN LINERS)**

**East-West:**

Boston-Europe

**North-South:**

Boston-Bermuda/Florida/Caribbean

**INTERREGIONAL INTERMODAL PASSENGER CORRIDORS (AIR)**

(Note: Flow-arrow width not exactly calibrated to percentages shown; foreign flows underreported, since foreign carriers are not included in FY '93 Massport statistics used.)

**East-West:**

Logan Airport-Ontario & Pacific Northwest

Logan Airport-London & Paris

Logan Airport-Midwest & Southwest

Logan Airport-Northeast Corridor & South Atlantic

**North-South:**

Logan Airport-Montreal

## 4.2 Massachusetts Intermodal Facility Identification

The base inventory of intermodal facilities for Massachusetts shown in the following tables provides an example for other states of the extent of detail and geographic and modal scope needed in such inventories.

**Table 4.3**  
Freight Intermodal Facilities in Massachusetts

### Airports

(to/from truck, rail)

Barnes Municipal, Westfield/Westover AFB (military), Chicopee  
 Barnstable Municipal (Hyannis), Barnstable  
 Hanscom Field (military), Bedford  
 Logan Airport, E. Boston (Note: 61% of New Engl. enplanements; Massport oper.)  
 Martha's Vineyard Airport, Martha's Vineyard  
 Nantucket Memorial, Nantucket  
 New Bedford Airport, New Bedford  
 Worcester Municipal Airport  
Potential future additions:  
 Fort Devens (Moore's Field) (military), Ayer  
 Otis AFB (military), Falmouth  
 U.S. Naval Air Station (military), South Weymouth

### Bus Stations

(to/from pickup and delivery vehicle)

Back Bay Station, Boston  
 Fitchburg Bus Station, Fitchburg  
 Hyannis Bus Station (Peter Pan Trailways, Bonanza, Plymouth & Brockton), Hyannis  
 New Bedford Bus Station (American Eagle Motor Coach, Bonanza), New Bedford  
 Pittsfield Bus Station, Pittsfield  
 South Station Transportation Center (Concord Trailways, etc.), Boston  
 Springfield Bus Station (Peter Pan Trailways, Vermont Transit, etc.), Springfield  
 Worcester Greyhound Bus Station, Worcester  
 Worcester Peter Pan Bus Station, Worcester

### Pipeline Transfer Facilities (Tank Farms) ("fac. TBL" = Exact facility to be located)

(to/from rail, truck, water)

Algonquin Gas Transm. Co. (southeastern MA, nat. gas), fac. TBL  
 Buckeye Pipeline Co. (New Haven to Hartf. & Springf.; refined petrol prods.), fac. TBL  
 Granite State Gas Transm. (Portland, ME, to Haverhill), fac. TBL  
 Mobil Pipeline Co. (Prov., RI, to Springfield; refined petroleum products), fac. TBL  
 Tennessee Gas Pipeline Co. (Adams, MA, to Torrington, CT, Cranston, RI, Concord, NH, and Gloucester, MA; natural gas): Adams, Gloucester; other fac. TBL

### Rail

(to/from truck, water)

Reagan Park (Consrail terminal), 100 Cambridge St., Allston

### Springfield Terminal (Conrail, West Springfield)

Worcester: Conrail's facility; Providence & Worcester's Southbridge St. and Wiser Ave. facilities run by Intransit Container, Inc. (ICI); CSX Intermodal shares with P & W at Southbridge St. facility

#### Potential future additions:

Allied Systems' facility in Ayer for rail cars containing autos  
Braintree (Conrail) for steel  
East Brookfield intermodal facility  
Framingham Conrail terminal (auto)  
New England Automotive Gateway (NEAG), Spencer/East Brookfield  
Westborough Conrail terminal (auto)

### Truck

(to/from air, rail, water, pickup & delivery vehicle)

For-hire trucking company clusters are ranked below by number, shown in parentheses, of 1990-91 Massachusetts Business Directory for-hire trucking company listings. The clusters are named for town(s) with the most listings; other non-named contiguous towns are included in appropriate cluster(s) and in the total(s) shown. For full explanation and source listing see: Capelle, Russell B., Jr. "High Trucking Activity Towns in Massachusetts: Results of a Preliminary Analysis." Unpublished manuscript, CTPS, Ste. 2150, 10 Park Plaza, Boston, MA 02116, 3/16/94.

Springfield-West Springfield-Chicopee/Chic. Falls (84)

Route I-495--Concord to Foxboro (68)

Worcester-Shrewsbury (61)

E. Boston-Charlestown-Everett (43)

Brockton-Avon-W. Bridgewater (40)

Woburn (11)

South Boston (27)

Cambridge-Somerville (26)

Seekonk (25)

Billerica (25)

Stoughton-Norwood (23)

Boston (22)

Methuen (21)

Fitchburg-Leominster (20)

Peabody (17)

Waltham (12)

Taunton (12)

Pittsfield (11)

Fall River (9)

New Bedford (9)

### Water

(to/from rail, truck)

*Boston, Port of (Massport's Conley [So. Boston] & Moran [Chastwn.] terminals)*

Chelsea Creek, Chelsea (2/3 of New England's petroleum through here)

Fall River

New Bedford

Salem

Weymouth Fore River, Weymouth (petroleum; Citgo tanks in Braintree)

**Table 4.4**  
**Intermodal Facilities for Interregional Passengers in Massachusetts**

**Airports** (to/from car, taxi, limo, bus, train, ferry, liner)

(P = Regularly scheduled passenger service--acc. to MAC's System Report, 1989)

Barnes Municipal, Westfield/Westover AFB (military), Chicopee

Barnstable Municipal (Hyannis), Barnstable P

Hanscom Field (military), Bedford P

Logan Airport, E. Boston (Note: 61% of New Engl. enplanements; Massport oper.) P

Nantucket Memorial, Nantucket P

New Bedford Airport, New Bedford P

Worcester Municipal Airport P

Potential future additions: Fort Devens (Moore's Field) (military), Ayer

Otis AFB, Falmouth

U.S. Naval Air Station, South Weymouth

**Bus Stations** (to/from car, taxi, limo, train, plane, ferry, liner)

Back Bay Station, Boston

Fitchburg Bus Station, Fitchburg

Hyannis Bus Station (Peter Pan Trailways, Bonanza), Hyannis

New Bedford Bus Station (American Eagle Motor Coach), New Bedford

Pittsfield Bus Station, Pittsfield

South Station Transportation Center (Concord Trailways, etc.), Boston

Springfield Bus Station (Peter Pan Trailways, Vermont Transit, etc.), Springfield

Worcester Greyhound Bus Station, Worcester

Worcester Peter Pan Bus Station, Worcester

**Rail Stations** (to/from car, taxi, limo, bus, plane, ferry, liner)

(NEC = numerous arrvls. & dep. to/from Northeast Corridor markets)

North Station, Boston NEC

Route 128 (Amtrak) Station, Westwood NEC

South Station, Boston NEC

Springfield (Amtrak) Station, Springfield NEC, Chicago

Worcester (Amtrak) Station, Worcester 6 arr. & dep. per day to NEC, Chicago

Significant summer service from NY, etc.:

Buzzard's Bay

Hyannis

Sandwich

Taunton

Wareham

Potential future additions:

Amherst (1 train to, 1 train from Montreal)

Framingham (3 arr. & dep. per weekday to Chicago and NYC)

Pittsfield (1 train to, 1 train from Chicago)

Union Station Intermodal Transportation Center, Worcester

**Water/Port Facilities** (to/from car, taxi, limo, bus, plane, train)

Black Falcon Passenger Terminal (ocean liners), South Boston

Hyannis (Nantucket ferries; trucks = 55% of occupied deck space)

Woods Hole (Nantucket & Martha's Vnyd. ferries; trucks = 37% of occupied deck space)

Potential future additions:

Commercial Wharf (Boston-Provincetown ferry--spring-fall only), Boston

Fall River (port o' call for seasonal trips betw. NYC & Montreal [NETI study])

Falmouth Harbor to Martha's Vineyard

New Bedford to Martha's Vineyard and Cuttyhunk Island

**Table 4.5**  
**Major Clusters of**  
**For-Hire Trucking Activity in Massachusetts\***

	Number of For-Hire Trucking Co. Listings in <b>MBD**</b> (Total of Numbers in Parentheses at Right)	Massachusetts Towns
84		<b>SPRINGFIELD-W. SPRINGFIELD-CHICOPEE/CHIC. FALLS</b> (32, 13, 15) Agawam (8), Westfield (9), Holyoke (7)
68		<b>ROUTE I-495, CONCORD TO FOXBORO</b> —Concord (2), Acton (3), Stow (3), Hudson (3), Marlboro' (6), Northboro' (3), Westboro' (8), Southboro' (3), Framingham (5), Ashland (6), Hopkinton (6), Milford (4), Mendon (4), Bellingham (4), Franklin (4), Wrentham (3), Foxboro' (1)
61		<b>WORCESTER-SHREWSBURY</b> (30, 20), Auburn (5), Millbury (3), Grafton (3)
43		<b>E. BOSTON-CHARLESTOWN-EVERETT</b> (7, 7, 14), Chelsea (6), Malden (4), Revere (5)
40		<b>BROCKTON-AVON-W. BRIDGEWATER</b> (11, 9, 7), Abington (3), Whitman (2), E. Bridgewater (3), Bridgewater (2), Easton (3)
34		<b>WOBBURN</b> (11), Winchester (5), Burlington (3), Reading/No. R (11), Stoneh. (4)
27		<b>SOUTH BOSTON</b> (20), Dorchester (3), Roxbury (3), W. Roxbury (1)
26		<b>CAMBRIDGE-SOMERVILLE</b> (8, 11), Arlington (3), Medford (4)
25		<b>SEEKONK</b> (19), Rehoboth (4), Attleboro/So. Attleboro (2)
25		<b>BILLERICA/No. Billerica</b> (20), Tewksbury (5)
23		<b>STOUGHTON-NORWOOD</b> (13, 6), Canton (2), Sharon (2)
22		<b>BOSTON</b> (13), Allston (3), Brighton (1), Newton (1), Needham (2), Dedham (2)
21		<b>BRAINTREE</b> (9), Quincy/No. Quincy (3), Randolph (5), Holbrook (1), Weymouth/E. Weymouth (3)
21		<b>METHUEN</b> (8), Haverhill (5), Lawrence (3), Andover/N. Andover (5)
20		<b>FITCHBURG-LEOMINSTER</b> (7,8), Lunenburg (4), Sterling (1)
17		<b>PEABODY</b> (9), Lynn (6), Salem (1), Danvers (1)
12		<b>WALTHAM</b> (10), Lexington (1), Watertown (1)
12		<b>TAUNTON</b> (6), Raynham (4), Norton (2)
11		<b>PITTSFIELD</b> (11)
9		<b>FALL RIVER</b> (3), Westport/No. Westport (3), Somerset (2), No. Swansea (1)

Table 4.5--Continued

9 NEW BEDFORD (8), Acushnet (1)

## Notes:

\* Major clusters are defined as town(s) with ten or more listings in MBD and contiguous towns with listings, or town(s) with 5 to 9 listings whose contiguous towns with listings bring the total to 10 or more, or one of three exceptions--New Bedford (with Acushnet, just 9 MBD listings), Fall River (none in the cluster have MBD listings above 5), and Route I-495 Concord-Foxboro (an elongated circumferential set of towns clustered for convenience).

\*\*The source for number of for-hire trucking company listings is the 1990-91 edition of

Massachusetts Business Directory (MBD) (Omaha, NE: American Directory Publishing Co.). Listings under "Trucking Motor Freight" and under four other subcategories are used. Those four other for-hire trucking subcategories and the total number of 1990-91 MBD listings are as follows: dump truck (96), heavy-hauling (88), liquid and dry bulk (30), and local cartage companies (17).

The above clusters exclude information on other trucking industry subcategories, because they are minor subcategories or because listings are not included in MBD and are not readily available elsewhere. These are some of the excluded trucking subcategories: government (federal, state, and local) fleet locations, private fleets (manufacturing firms, retail chains, and other companies that own their own fleets), truck stops (MBD lists 11 locations), and "trucking terminals" (MBD lists 2 locations).

The highest concentration of clusters occurs in eastern Massachusetts: fourteen of the 21 clusters (67%) are on or east of Boston-region circumferential Route I-495. The seven "outliers" include Springfield (84), Worcester-Shrewsbury (61), Seekonk (25), Fitchburg-Leominster (20), Pittsfield (11), Fall River (9), and New Bedford (9).

## 5. MASSACHUSETTS PERFORMANCE MEASURE SELECTION PROCESS

### 5.1 Performance Evaluation System Design

What is a performance measure? The December 1, 1993, Interim Final Rule (p. 63448) clarifies: "performance measures' has been defined to mean 'operational characteristic, physical condition, or other appropriate parameters used as a benchmark to evaluate the adequacy of transportation facilities and estimate needed improvements.'"

The Interim Final Rule does, however, distinguish between a performance measure and a performance standard: "The interim final rule requires the development of performance measures rather than efficiency measures and performance standards" (p. 63469)--a change from the earlier NPRM, made because commenters "were concerned that an IMS should not establish standards since the expectation of service will vary between communities and private industry."

In other words, IMS planners should search for all *types* of performance measures and for databases and data sources which will provide *observations* on those measures, and make decisions on (1) the particular performance measures that are most suitable for the appropriate state or MPO region; and (2) the *threshold* for the performance measure above which there is significance and below which there isn't (e.g., above 1,000 ton-miles per year a corridor could be defined as "major" or "significant").

IMS planners are not required to abide by performance measure *standards* set by the federal government or by groups of state or MPO governments. For example, if 1,000 ton-miles per year is the *threshold* which Iowa IMS planners use to define "significant freight intermodal corridor," that is not necessarily the *threshold* for significance in Massachusetts. Because of the great variation in flow magnitudes, it is not useful or appropriate to set a quantitative performance measure standard and mandate its use. States and MPOs are given flexibility by the Interim Final Rule and other ISTEA regulations; they should use it and set thresholds which define *regionally significant* intermodal corridors and intermodal facilities based upon available data for performance measures upon which they decide.

## 5.2 Coordination with Private Transportation Providers Is Critical

The Interim Final Rule discusses intermodal performance measures (p. 63468) briefly, noting that agencies "in coordination with private transportation providers, will need to establish their own performance measures." However, it does not spell out suggested performance measures for the IMS in as much detail as it does for the CMS (pp. 63464-63465), even though it says in subpart E (p. 63465) that it will in subpart G.

The following explanation is given (p. 63469): "Section 500.707(c) was changed and the base year inventory will include data for physical and operating characteristics [rather than for physical condition and operating characteristics]."

The following "parameters" are listed (p. 63483): "Parameters may include the total travel time, cost, and volumes for moving cargo and passengers, origins and destinations, capacity, accidents, ease of access, perceived quality, and the average time to transfer people or freight from one mode to another. . . . Performance measures shall be established cooperatively at the state and local levels with private sector coordination, as appropriate."

The Interim Final Rule notes that "agencies, in coordination with private transportation providers, will need to establish their own performance measures" (p. 63468). Indeed, coordination with private companies will be the key to obtaining data on freight flow performance measures for freight intermodal facilities. (To use a Massachusetts example to illustrate the challenge public agencies would face without private sector help: Can you imagine getting data on how many lifts per day, trucks per day, containers per day, or rail cars per day move into/out of Beacon Park [a large rail/truck intermodal yard in Boston] without the cooperation of Conrail?)

The Freight Advisory Council is not just a formality, but a necessity. It is *the* most important *networking resource*. Agencies can find out what issues are important to private sector users, define data needs on that basis, and initiate mechanisms for sharing private sector freight intermodal information.

However, public agencies do have options: "The interim final rule provides the flexibility for states and local agencies to select and establish data bases that are not excessively cumbersome to create or maintain. Proprietary information is not required and existing public data sources could be used to meet the requirement for data collection and system monitoring. The interim final rule encourages states and local agencies to build on the relationship between public and private sector transportation providers" (p. 63467).

### **5.3 Performance Measure Examples from Federal Agencies and Other States and MPOs**

What **particular** performance measures does the IMS team want to include? How is our choice of performance measures affected by what data we have or can get?

At the July 1993 intermodal conference in New York City, this list of "IMS Performance Measure Categories" was presented:

- Physical Limitations
- Accessibility of Intermodal Facilities
- Transferability and Coordination Between Modes
- Legal and Regulatory Constraints
- Delivery and Collection Systems
- Safety
- Economic and Environmental Tradeoffs

Also presented at the intermodal conference were potential performance indicators for use in California (see Table 5.2)

**Table 5.1**  
**Potential Performance Indicators Considered in California**

<u>Person Movement Market</u>	<u>Freight Movement Market</u>
<i>MOBILITY</i>	
Mobility index (PMT/VMT x avg. spd)	Mobility Index (ton-mi./veh.-mi. x average speed)
V/C ratio (or LOS)	
Lost time due to congestion (per trip or mi.)	Lost time (per trip or mile)
<i>FINANCIAL</i>	
AEC/person mile (owner cost)	AEC/ton-mile
User costs/person mile (user cost)	Avg. costs/ton-mi. (incl. change in lost time)
<i>ENVIRONMENTAL</i>	
Chnge in tons of pollution (or or pollution/person-mile)	Change in tons of pollution (or pollution/ton-mile)
Chnge in tons of grn hse. gases or greenhouse gases/person-mile)	Change in tons of greenhouse gases/ton-mile)
Change in fuel consump./person-mile	Change in fuel consump./ton-mile
<i>ECONOMIC</i>	
Jobs supported	Jobs supported
GAP impacts	GAP impacts
Economic costs of pollution, accidents, fatalities, lost time	Economic costs of pollution, acci- dents, fatalities, lost time
<i>SAFETY</i>	
Accidents/person-mile (or per mil- lion person-miles)	Accidents/ton-mile (or per mil- lion ton-miles)
Accids. at major intermodal crossings	Accids. at major intermodal crossggs.
<i>QUALITY OF LIFE</i>	
Availability (choice of modes) for corridors and intermodal transfer facilities	[none listed]
<i>OTHER</i>	
Pers. mi./veh. mi./fuel cons. per capita	Ton-mile per capita, value per ton
<i>INTERMODAL TRANSFER FACILITIES</i>	
Person transfers/hr., average transfer time, capacity utilizn. (v/c) for access roads	Tons transfd./hr., avg. transf. time capacity utilizn. (v/c) for access rds.

Another reference document which provides excellent detail on *intermodal* performance measures is by A. Ashar of the National Ports and Waterways Institute. His August 1993 paper, "Performance Indicators for Intermodal Freight Terminals," reviews the relevant literature, presents several performance measure alternatives, includes several detailed tables listing potential performance measures, and is particularly appropriate for IMS planning for port intermodal terminals.

Christopher R. Fleet of the Federal Highway Administration's Office of Environment and Planning provided valuable information for IMS planners wrestling with performance measure questions in "Data Needs for Management Systems," a paper presented at the TRB Conference on Transportation Data Needs: Programs for a New Era, in Irvine, CA, May 27-29, 1992 (see List of References). Below is an excerpt from Mr. Fleet's paper listing performance measures and relevant data categories and sources:

*Measures:*

- cost/ton mile by mode
- cost/passenger mile by mode
- average value/pound (freight)
- on-time performance
- average transfer time between modes (passenger and freight)
- average cost due to losses or theft per trip by mode
- average accident cost per trip by mode

*System Data:*

- ton miles
- passenger transfers
- freight losses from thefts (total value)
- accidents
- useful life of assets
- access facilities under construction (to airports, railroads, harbors, intermodal centers)

*Usage of the System or Demand Data:*

- passengers
- freight by category-frequency and duration
- proportion of freight delayed
- proportion of passengers delayed by transfer

*Time of Cost to Use the System Data:*

- transfer time--peak and off-peak
- headway
- average travel time of freight during peak and off-peak
- transfer cost

Location of Area of Interest *Data*:

intercity

intracity

international

transfer points

routes and lines

Primary *Sources* of Data:

on board surveys

employer surveys

surveys at intermodal centers

travel time surveys

shipping surveys

Secondary *Sources* of Data:

census data

section 15 data

system inventories (harbor, airport, railroad)

truck inventory and use survey

## **5.4 Massachusetts IMS Team Decisions on Performance Measures**

The Massachusetts IMS team is organizing information on performance measures and has discussed particular measures within the framework of a cube chart display as shown in Figure 5.1. That display allows one to portray performance measures categorized by system/corridor/facility level (x-axis), mode (y-axis), and goal/objective/strategy/issue (z-axis). Using that cube chart and various highlighting procedures (shading, boldface, and so on), one can display, for example, passenger and freight performance measures for a particular goal (e.g., "improve the efficiency of the intermodal system") for all modes. Table 5.2 shows 2 "slices" of the cube chart representing the displays for two of the four objectives established for the Massachusetts intermodal management system.

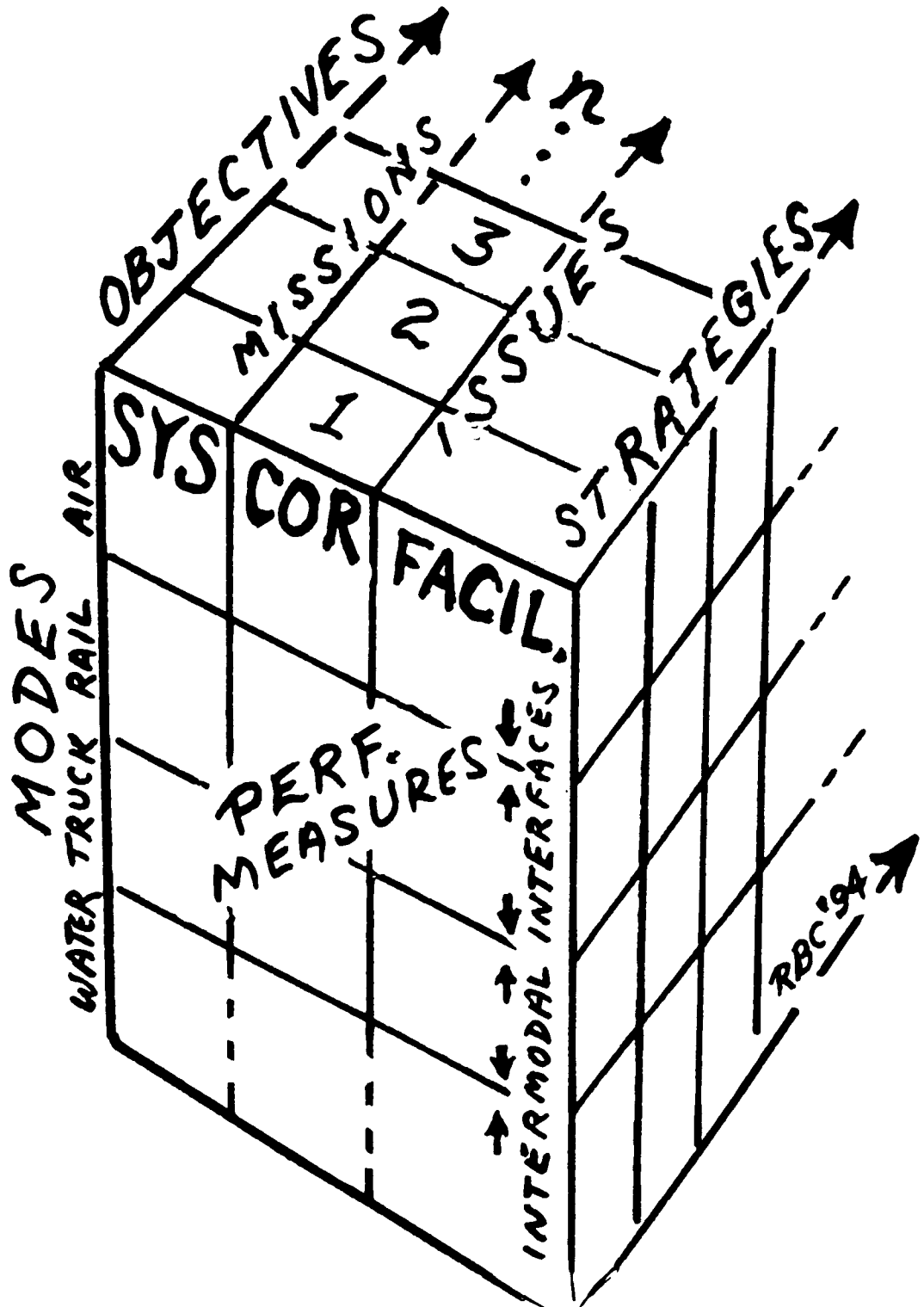
The final list of performance measures for Massachusetts will continue to be developed after October 1, 1994, as part of the IMS work plan. It will be important to gather information from the private sector at meetings of the Massachusetts Freight Advisory Council, which hasn't been implemented as of this writing (late summer 1994). Ideas on appropriate freight intermodal performance measures may change after discussion with the council.

Another unknown involves data availability. Expansion of the performance measure options depends to a great extent on which types of data are available or can be made available within budget limitations.

**Table 5.1**  
**Potential Performance Indicators Considered in California**

Person Movement Market		Freight Movement Market
	<b>MOBILITY</b>	
Mobility index (PMT/VMT x average speed)		Mobility index (ton-mile/vehicle-mile x average speed)
V/C ratio (or LOS)		
Lost time due to congestion (per trip or mile)		Lost time (per trip or mile)
	<b>FINANCIAL</b>	
AEC/person mile (owner cost)		AEC/ton-mile
User costs/person mile (use cost)		Average costs/ton-mile (including change in lost time)
	<b>ENVIRONMENTAL</b>	
Change in tons of pollution (or pollution/person-mile)		Change in tons of pollution (or pollution/ton-mile)
Change in tons of green house gases (or green house gases per person-mile)		Change in tons of greenhouse gases (or greenhouse gases per ton-mile)
	<b>ECONOMIC</b>	
Jobs supported		Jobs supported
GAP impacts		GAP impacts
Economic costs of pollution, accidents, fatalities, lost time		Economic costs of pollution, accidents, fatalities, lost time
	<b>SAFETY</b>	
Accidents/person-mile (or million person-miles)		Accidents/ton-mile (or million ton-miles)
Accidents at major intermodal crossings		Accidents at major intermodal crossings
	<b>QUALITY OF LIFE</b>	
Availability (choice of modes) for corridors and intermodal transfer facilities		[None listed]
	<b>OTHER</b>	
Person-miles/vehicle-miles/fuel consumption per capita		Ton-mile per capita, value per ton
	<b>INTERMODAL TRANSFER FACILITIES</b>	
Person transfers per hour, average transfer time, capacity utilization (V/C) for access rds.		Tons transferred per hour, average transfer time, capacity utilization (V/C) for access rds.

Figure 5.1



## 6. CONCLUSIONS

Intermodalism, like beauty, is in the eye of the beholder. Each MPO/state needs to define intermodalism for itself. Yet although there are differences in perspective and definition, there are commonalities--directories, databases and other data sources.

An intermodal management system in practice is a *structured process* for data collection, analysis, and synthesis, providing transportation professionals with the foundation for making strategic and policy decisions. Because most freight intermodal data are in the private sector, planners and transportation companies will have to work together to develop appropriate information input to the IMS ("*cooperation*" is one of the four "C" words in IMS planning).

The six management systems and the traffic monitoring system for highways must *work together* ("*coordination*"). In the end they should be viewed as one management system with interdependent components. Ultimately the intermodal management system will provide alternatives, "*choices*," options, flexibility, increased efficiency/mobility/accessibility within the total transportation system--not just at isolated transfer points in the intermodal system today, but at "*connections*" throughout the intermodal corridors

IMS planning, more than planning for any other management system, involves reaching out beyond agency walls and meeting with private sector data providers and users in a Freight Advisory Council or other such structure. Learning from each other, airing issues of mutual concern, and working together toward the common goal of accurate and responsive planning for future modal interfaces, transfers, and synergy is rewarding. The adversarial, mode-against-mode atmosphere of pre-ISTEA days is no longer appropriate as we move into the 21st century--the Intermodal Century!

## GLOSSARY

*Corridor, Distributive--See "Corridor, [Major] Feeder or Distributive"*

*Corridor, Feeder--See "Corridor, [Major] Feeder or Distributive"*

*Corridor, [Major] Feeder or Distributive*

An elongated area [in Massachusetts], connected to and often nearly perpendicular to a major intermodal corridor but extending beyond its borders, within which there are one or more linear transportation facilities serving the functions of feeding goods and/or passengers from their origins to a major intermodal corridor or corridors and/or distributing them from a major intermodal corridor or corridors to final destinations. A *major* feeder corridor or distributive corridor would have one or more *major* linear transportation facilities as defined here. Major or minor feeder/distributive corridors are **not necessarily intermodal**; even a major feeder/distributive corridor may not have other (nonhighway) modal alternatives closely paralleling it (which would classify it as "intermodal"), perhaps because it is a circumferential highway. Thus a feeder or distributive corridor can be the same as its defining linear transportation facility.

*Corridor, [Major] Intermodal*

An elongated area [in Massachusetts] within which there are two or more different, usually parallel, major linear transportation facilities representing two or more modes. Major linear transportation facilities within the same corridor should be within [e.g., 10] miles of each other for the majority of the length of the corridor. Major intermodal corridors connect with major intermodal corridors in surrounding regions.

*Facility, [Major] Intermodal*

Polygonal facility, usually but not necessarily within a major intermodal corridor, at which more than \_\_\_\_\_ transfers from one mode to another occur per year (other types of performance measures may be used). Examples: large rail/truck facilities (Conrail's Beacon Park facility in Boston), Port of Boston's Conley and Moran terminals, intercity bus company stations, fuel tank farms at pipeline termini, and trucking company headquarters or terminals for ICC Class I or II for-hire motor carriers of property (above \$3 million in revenue).

*Facility, [Major] Linear Transportation Facility*

Linear fixed surface transportation facility or air/water travel lane on or in which transportation operating equipment moves from place to place; categorization as "major" may be based upon access control, revenue threshold of operating companies, magnitude of traffic, or other such attributes. Massachusetts examples: NETI-defined freight railroad "regional main line" (Conrail, Boston & Maine), Amtrak line, limited-access highway (NHS and other principal arterials), oceangoing vessel or cruise ship trade lane used by more than \_\_\_\_ ships per year, navigable river (Connecticut, Merrimack) or air passenger corridor used by more than \_\_\_\_ scheduled flights per year.

### *Freight Advisory Council*

A private sector/public involvement group which meets periodically and is designed to gain input and information from members who are representatives from private sector transportation companies, shippers, consignees and others with an interest in freight intermodal transportation.

*Goals/Objectives of an Intermodal Management System--See "Intermodal Management System"*

### *Interim Final Rule*

Official instructions relating to management and monitoring systems were published in "Management and Monitoring Systems: Interim Final Rule," Federal Register, December 1, 1993, pp. 63442-63485.

### *Intermodal[/Intermodalism]*

Pertaining to the transfer and flow of people and/or goods from one mode to another or among several modes. Latin derivation: *inter* = between; *modus* = way.

*Intermodal Corridor--See "Corridor, Intermodal"*

### *Intermodal Management System*

The goal of an intermodal management system is to provide the data analysis foundation for strategic decisions by MPO and state policymakers, for TIP project prioritization and selection and for statewide planning project decisions, and to provide a continuing understanding of intermodal transportation. The IMS includes procedures and computer software to analyze (for example) freight/passenger traffic and flow data; intermodal facility characteristics; and system, corridor, and facility performance measures.

The December 1, 1993 Interim Final Rule summarized what had to be done by those planning a state IMS:

"[The] processes and procedures that must be included in a State IMS...consist of [1] identification of intermodal facilities and performance measures, [2] data collection and system monitoring, [3] performance evaluation, and [4] identification of strategies and actions. Also the expected results of an IMS are described" (p. 63469).

Interim Final Rule, FR p. 62449: "Section 500.105(g) (500.105(c) in the NPRM) requires that the **results of the management systems be considered** in developing metropolitan and statewide transportation plans and improvement programs and in making project selection decisions."

Another objective of the IMS is highlighted in the IFR: "Section 500.105(j) (500.107(e) in the NPRM) requires that each management system include appropriate means to evaluate the effectiveness of implemented actions and that the effectiveness of all of the systems combined be periodically evaluated, preferably as part of the planning processes."

The IFR is succinct in its statement of goals focused on four "C" words that are at the core of IMS planning:

"500.705...(b) The IMS shall address intermodal transportation needs by a process that considers the following issues:

- (1) *Connections*. The convenient, rapid, efficient, and safe transfers of people and goods among modes that characterize comprehensive and economic transportation service.
- (2) *Choices*. Opportunities afforded by modal systems that allow transportation users to select their preferred means of conveyance.
- (3) *Coordination and cooperation*. Collaborative efforts of planners, users, and transportation providers to resolve travel demands by investing in dependable, high-quality transportation service either by a single mode or by two or more modes in combination" (p. 63483).

Ultimately the intermodal management system will provide alternatives, "choices," options, flexibility, and increased efficiency/mobility/accessibility at transfer points and throughout the total transportation system.

About the IMS implementation schedule, the IFR says:

"The FHWA and the FTA recognize that the development, establishment, and implementation of an IMS is a new requirement. The operation of an IMS will be a continuous process of refinement and improvement. As a minimum, the States are expected to have implemented the IMS elements identified in 500.707 by **OCTOBER 1, 1995**. The IMS must provide input to statewide and metropolitan area transportation plans, improvement programs, and project selection processes by **OCTOBER 1, 1996**." (Note that the work plan is due by **OCTOBER 1, 1994**.)

### *Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)*

Federal legislation that restructures and authorizes increased funding levels for transit and highway programs and mandates a necessary role for MPOs in ISTEA planning and funding decisions, requiring comprehensive regional transportation plans by the year 2015.

### *Metropolitan Planning Organization*

An organization composed of agencies with jurisdiction for a particular metropolitan region--specified by ISTEA as the organization responsible for comprehensive transportation planning and programming for urbanized areas.

### *Mode*

A way of transporting freight and/or passengers. Commonly accepted identifiers for the **freight** modes include: highway-truck, rail, pipeline, air, and water (inland or oceanborne). For IMS purposes, the **interregional passenger** modes include: highway-bus, rail, air, and water (e.g., ferry or cruise ship).

### *National Commission on Intermodal Transportation (NCIT)*

A presidentially appointed 15-member "blue-ribbon panel" of experts on intermodalism. The NCIT was created by ISTEA and it is commissioned to make a report to Congress by September 30, 1994, on the status of intermodal transportation today, the resources needed to enhance it, and the steps needed to achieve an efficient national intermodal transportation system. The chairman of the commission is Robert D. Krebs, chairman of Santa Fe Pacific Corporation. The executive director is Anne Aylward, former Maritime Director of the Massachusetts Port Authority. The commission's offices are located at 301 N. Fairfax St., Suite 110, Alexandria, VA 22314.

*National Highway System (NHS)*

The 159,000-mile national network of principal highways designated by Congress. It includes the Interstate Highway System plus other limited-access highways and principal arterials.

*National Transportation System (NTS)*

The proposed multimodal successor to the NHS (which it includes). NTS is proposed as a nationally integrated system of highways, rail links, pipelines, water routes, and other modes.

*New England Transportation Initiative (NETI)*

A research group inventorying, analyzing, and disseminating information on all modes of transportation in the six-state New England region.

*"Orple"*

A proposed measure that could be used to equate or analytically compare freight movements (oranges) and passenger movements (apples).

*Statewide Transportation Plan (STP)*

A long-range planning document that identifies facilities and programs in the state that should function as an integrated transportation system and includes a financial plan that demonstrates how the long-range plan can be implemented.

*Transportation Improvement Program (TIP)*

A program of transportation projects consistent with the metropolitan or statewide transportation plan. The TIP shows projects to be funded under federal programs for a three-year period. Output from the IMS is input to the TIP project prioritization process.

*Work plan, intermodal management system*

To be completed by October 1, 1994, to permit the MPO to be certified by the federal government, a work plan for an IMS or other management system is referred to in the December 1, 1993, Interim Final Rule (p. 63450) as follows: "the work plan will be used as the measure of compliance." It is defined (p. 63448) "to mean 'a written description of major activities necessary to develop, establish, and implement a management or monitoring system, including identification of responsibilities and target dates for completion of the major activities.'" "500.709...(a) By **OCTOBER 1, 1994**, the State shall develop a work plan that identifies major activities and responsibilities and includes a schedule that demonstrates full operation and use of the IMS by October 1, 1996."

## List of References

The citations are in one group and listed alphabetically for easy reference. Certain codes and highlighting procedures are used to indicate different groups or categories of reference document. If there is no code, the reference document deals with forecasting models or methods, data management, or policies and strategies related to intermodal management system planning.

### Codes and Highlighting Procedures

**Year in boldface** = Older reports/articles/and other documents (**pre-1980**)

*Italicized citations* = Internal Mass. agency memos; national/regional workshop/conference handouts

\* = Included in the materials provided to each attendee of the following conference in New York City in July 1993: "U.S. DOT Presents United Links for the United States" (July 14-16, 1993, Sheraton New York, New York, NY)/

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"Intermodal Commission Shifts Into High Gear" (by Rip Watson). Journal of Commerce, January 12, 1994. National Commission on Intermodal Transportation elected Robert D. Krebs, chairman of Santa Fe Pacific Corp. as its chairman. It will "begin working on its own report." The Commission's "broad task [is] to detail the progress, pitfalls and potential of intermodalism...." "[Commission] will solicit information from a broad spectrum of passenger and freight interests through public meetings, trips to intermodal facilities and publishing a notice in the Federal Register to solicit views. Contract research also is a possibility." "More than \$500,000 has been authorized to fund the commission . . ." "15 members . . . report will be due by Sept. 30, 1994." Members include Thomas J. Donohue, ATA; John W. Snow, Chairman of CSX Corp.; but they were named before Clinton took office, so changes may take place. There will be "formal expansion of the group from 15 to 19." "New members tapped were Anne Canby, Delaware's secretary of transportation; Jacqueline Gillen, of the Advocates for Highway Safety, a trade group in Washington, D.C.; and Jackie Bacharach, a Los Angeles consultant who had been an official with the Los Angeles County Transportation Commission."

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**\*\*Intermodal Freight System Case Study:** [New York-New Jersey] Circumferential Commercial Corridor." Included in the '93 NYC Intermodal Conference looseleaf binder, in the "Freight Intermodal Case Study" section.

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ISTEA and Intermodal Planning: Concept, Practice, Vision. TRB Special Report 240. Proceedings of a Conference, Irvine, CA, December 1992. Washington, DC: Transportation Research Board, 1993.

#The IVHS Index, a directory of the intelligent vehicle highway systems of North America, including 380 profiles, is available for \$595 from Waters Information Services, Box 2248, Binghamton, NY 13902-2248; (800) 947-7947.

#Jane's Airport Review. Surrey, United Kingdom: Jane's Information Group Limited, latest edition.

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Jelavich, Mark S. See "Middendorf, David..."

Jelavich, Mark S. (in 1978 of Jack Faucett Associates, Inc., Chevy Chase, MD). "A Study of the Determinants of Freight Modal Choice," manuscript of a paper to be presented at Session No. 143, Transportation Research Board meetings, January 19, 1978. Good review of early mode choice modeling. See pp. 2-3 and footnotes for quick overview of past research; pp. 4-7 highlight equations and cite the Kullman MIT dissertation of '73 (footnote on p. 4). Later published as: Jelavich, Mark. "Determinants of Freight Modal Choice (Abridgement)," Transportation Research Record 668, 1978, 14-16. Presents mode split equations to be utilized to determine the mode split between rail and truck. Variables in the equation include weight class of shipment, value, and line haul trip length. Data requirements include: origin/destination of shipment, value of the commodity, type of commodity, "base" shipment mode, weight of shipment, and length of trip. Data used were from the Census of Transportation and Census of Manufacturers. Eighty-six percent of the products were matched between the Standard Transportation Commodity Code (STCC) and the Standard Industrial Classification Code (SIC). This matching was necessary to combine the two data sets.

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Kanaʼani, Adib; Asad Khattak; and Joy Dahlgren (of ITS, U. CA-Berk.). "A Planning Methodology for Intelligent Urban Transportation Systems". [i.e., PLANiTS]. Paper No. 940418, presented at 1994 Transportation Research Board, Washington, DC.

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zones...an iterative factoring process...to factor externally oriented trips.] Second step: distribution of forecasted freight flows between various modes based on mode split models; this attempt was deemed successful. Data utilized for freight flow matrix--from ICC 1% waybill, "FHWA Nationwide Truck Commodity Flow Study," and waterborne commerce statistics from the Corps of Engineers. Production and consumption growth factors were developed for each zone based on forecasts of earnings by industry.

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Most of the data and techniques are presented and discussed at the state or county level. This will cause substantial limitations when attempting to apply the methods to a regional context. Many of the estimation techniques may be too "rough" for disaggregate demand modeling. Possible mode split estimation techniques based on either marginal unit costs, actual or estimated rates, or physical distribution costs are presented. Data sources and transformation procedures necessary for mode split estimation models are discussed. Specific examples for developing cost and rate estimates are given. Traffic assignment requires the conversion of commodity flows to vehicle equivalents. Application of traffic assignment estimates to pavement condition impact assessment is discussed.

Three detailed case studies are presented: "Expected Changes in Commodity Flows on the New York State Barge Canal System"; "Expected Changes in Grain Movements"; and "RoadRailer Service in the Buffalo to New York City Corridor." These are primarily state-level applications with interstate transport implications. These case studies are particularly useful; they describe each step of the analysis procedure, from data development to policy implications.

National Cooperative Highway Research Program. Freight Data Requirements for Statewide Transportation Systems Planning: Research Report. NCHRP Report 177. Washington, DC: NCHRP, Transportation Research Board, 1977. Assesses freight data requirements, data availability, and unmet data needs in relation to problems and issues (as defined in 1976). The information is presented by mode for various planning stages, by data category, and by planning activity. Data development strategies are also identified. Four kinds of planning activities were examined in detail: demand forecasting, mode choice analysis, economic evaluation, and impact estimation. The report highlights the interdependence of economic forecasts and commodity flow estimates and concludes that better techniques for accounting for economic interdependencies, differential regional growth and specialization, and the impacts of new technologies must be developed.

Four freight demand forecasting methods were identified as being the most useful for state-level use, namely: 1) regression analysis, 2) econometric models, 3) input-output models, and 4) economic base studies. Forecasting done to date was found to be primarily focused on the short-range, national or corporate in scope, trend-oriented, and dependent on historical commodity flow data.

The most important unmet data needs were found to be: commodity flow and traffic flow data, routing data, rates and tariffs data, transport level-of-service data; and unit cost

data. The study recommended that the Census of Transportation be expanded in its coverage to include more economic sectors (i.e., agriculture, mining, and wholesale) and more transport modes and attributes. Available data are insufficiently detailed geographically to be readily applicable at the state and substate levels.

Appendix A to this report contains several matrices which depict data requirements for rail, waterway, air, motor carrier, and port planning at the state DOT level, cross-classified by the problem or issue being addressed.

Appendix B describes various freight demand estimation techniques and the data requirements for each type. The various types of estimation techniques are organized into the following categories: quantitative, time-series and projection, and qualitative. Quantitative methods discussed include regression analysis, econometric models, input-output models, and economic base studies. The study concludes that all methods are highly dependent upon historical and/or present-day commodity or traffic flow data.

Appendix C describes mode choice models suitable to statewide transportation systems planning and their attendant data needs. The principal difficulty in applying mode choice models is the lack of consensus on attribute relevance and order of priority in the mode choice decision. A detailed listing of freight mode choice models in existence is included, identifying a reference person and the year developed and describing the model.

Appendix D describes network analysis techniques having potential application to freight demand modeling. Network models are necessary to assess the impacts on freight flows of changes in infrastructure availability or level of service and, additionally, to determine the infrastructure impacts associated with changes in freight flows and/or mode choice. Routing decisions made based on management policies and decisions are not possible to model in a mechanical, algorithmic manner and therefore require "manual" assignment procedures. Freight "traffic flows" can be assigned to the network in units of tonnage, vehicles, and revenues.

Appendix E describes economic evaluation techniques and data requirements. Both capital and operating cost data are necessary. Revenue data can be obtained in the form of rates which are charged by public freight carriers. In addition transport time and reliability are necessary factors in determining shipment costs and route and mode choices. Procedures for estimating travel time and the value of that time are described.

Appendix F describes a number of analytical procedures used to estimate the impacts of changes in freight transportation infrastructure or services. Impacts to roadbed, emissions, energy use, and noise are some of the impacts which may be necessary to predict based on changes in freight demand, transport level of service characteristics, and transport mode choice.

Appendix G presents a summary of unmet data needs and strategies for resolving deficiencies. Data are sorted by category. For each category there is an assessment of the form, availability, characteristics, and deficiencies. The strategies proposed are particularly dated and not as useful to current efforts to address data deficiencies. Of particular importance is the need to address and resolve the data limitations imposed by confidentiality and data suppression issues.

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